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THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED

THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER:

ELECTRO-PLATERS REVIEW.

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A MONTHLY JOURNAL RELATING TO THE METAL AND PLATING TRADES

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ELECTRO-PLATERS REVIEW.

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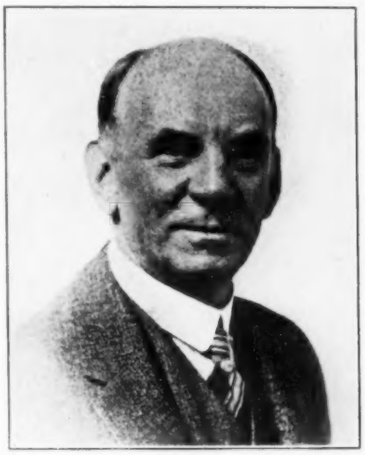
AMERICAN ELECTRO-PLATERS' SOCIETY CONVENTION

SOME ADVANCE INFORMATION RELATING TO THE 1916 MEETING OF ELECTRO-PLATERS TO BE HELD IN CLEVELAND, OHIO, JULY 7-8-9, 1916. THERE IS INCLUDED ALSO SOME REFERENCE TO THE ADVANTAGES OF CLEVELAND AS A CONVENTION CITY.

WRITTEN FOR THE METAL INDUSTEY BY H. J. TER DOEST, FOREMAN PLATER.

CIVIL ADVANTAGES OF CLEVELAND.

Cleveland as a convention city has all the advantages that a place can possibly have for such a gathering, having railroad facilities second to none, besides a beautiful lake frontage along its twelve miles of city streets. Delegates and visitors from north, east or west can reach it by boat from Buffalo, Detroit, or in fact from any city on the great lakes. A most pleasant trip is offered, as the boats are of the best and finest to be seen anywhere, they are as large as most ocean-going boats; in fact there are only six or ten ocean greyhounds that are larger than our great lake boats. Visitors to the convention from the east can take the boat at Buffalo, even if they have bought railroad tickets, as the boats will accept railroad tickets the same as their own. But this is not advisable, however, as it costs a little more that way by the time your stateroom is paid for. By coming to lake by rail and then getting lake transportation it costs no more than it would by rail, without a Pullman, and you have a very comfortable bed instead of sitting up in a day coach, and it is a very good way to get a good night's sleep, with the ever cool breezes of lake Erie to fan you to sleep on a warm night. Visitors can also come over from Detroit in the same way, and no one knows the delights of a boat ride like this unless he has had one.



H. J. TER DOEST

Cleveland surrounds Public Square, as there are four city squares in the center of the city called Public Square, from which the street cars radiate in every direction.

Cleveland, the sixth city of the United States, has a population of about 800,000, and hotels too numerous to mention and accommodations can be had to fit any size purse. The Hotel Statler, where the convention headquarters will be and where the convention will be held, has with its new addition, just completed, 1,000 rooms and a bath in every room, and prices range from $1.50 per day up. It is one of those places where everyone feels at home as it has that homelike atmosphere so much sought for by the traveler or vacationist, and it would be hard to find a place more suited to the needs of the convention. Cleveland's industries are so varied that one can hardly think of anything that is not made here, and a city of this kind is generally a very substantial city as it is not apt to be affected much by the failure of any one industry.

Cleveland has the distinction of being the first city to adopt 3-cent car fares and a monument to the late mayor, Tom Johnson, in bronze, adorns the public square and as a work of art will interest the plater very much, as will also the bronze work on the Soldiers and Sailors' Monument with its beautiful colorings that only Father Time can do. This is also on the Public Square.

A million-dollar art gallery, just about completed, will be opened June 6, 1916, or just one month before the convention and would be a very interesting place to go, especially for the ladies coming to the convention. This art gallery has water-filtered air pumped in for ventilation, which keeps it cool and keeps the dust out so as not to mar the beauties of art with dust. It has a special lighting system so arranged that the visitor after dark can view the work with the same light effects as the daylight visitor does.

Keith's Hippodrome, one of the finest and largest show houses in this country, may be an added attraction for the lovers of vaudeville.

Euclid avenue, the residential section that has been talked about as the most beautiful residence street in this country for years, is slowly but surely giving way to Euclid Heights as the residence place of Cleveland's most prosperous citizens. Edgewater Park, with its beautiful bathing beach, is inside the city limits, as are several other beaches. Euclid beach, which lies just outside the city, but can be reached by a 5-cent car fare, is a very attractive place for many. Luna Park, with its many attractions, also has an artificial bathing beach within its grounds. Here one can see the latest and best shows, dance, bathe, roller skate or do almost anything to amuse oneself. Cleveland has within the city limits 2,050 acres

of parks, one of which contains the Garfield Memorial and other statues of Cleveland's and the nation's great men of the past; but as THE METAL INDUSTRY will not want to devote the whole issue to the beauties of Cleveland I will have to come to a stop here, but I can assure visitors that there is enough more to keep them busy for some time.

PLATING INDUSTRIES OF CLEVELAND.

Now for what the readers of THE METAL INDUSTRY are perhaps more interested in, the plating shops. There are perhaps 150 or more places where plating is carried on in a large or small way.

Growth of the plating industry in Cleveland has been little short of phenomenal in the last few years. This is augmented by the fact that fifty years ago there was no such business in this city. Some question exists as to whether the Northern Ohio Plating Works or the present Ohio Plating and Manufacturing Company is the oldest, as both can trace their lineage back the greater part of a half century. There seems little doubt, however, that the former is the outgrowth of the original plating shop in Cleveland.

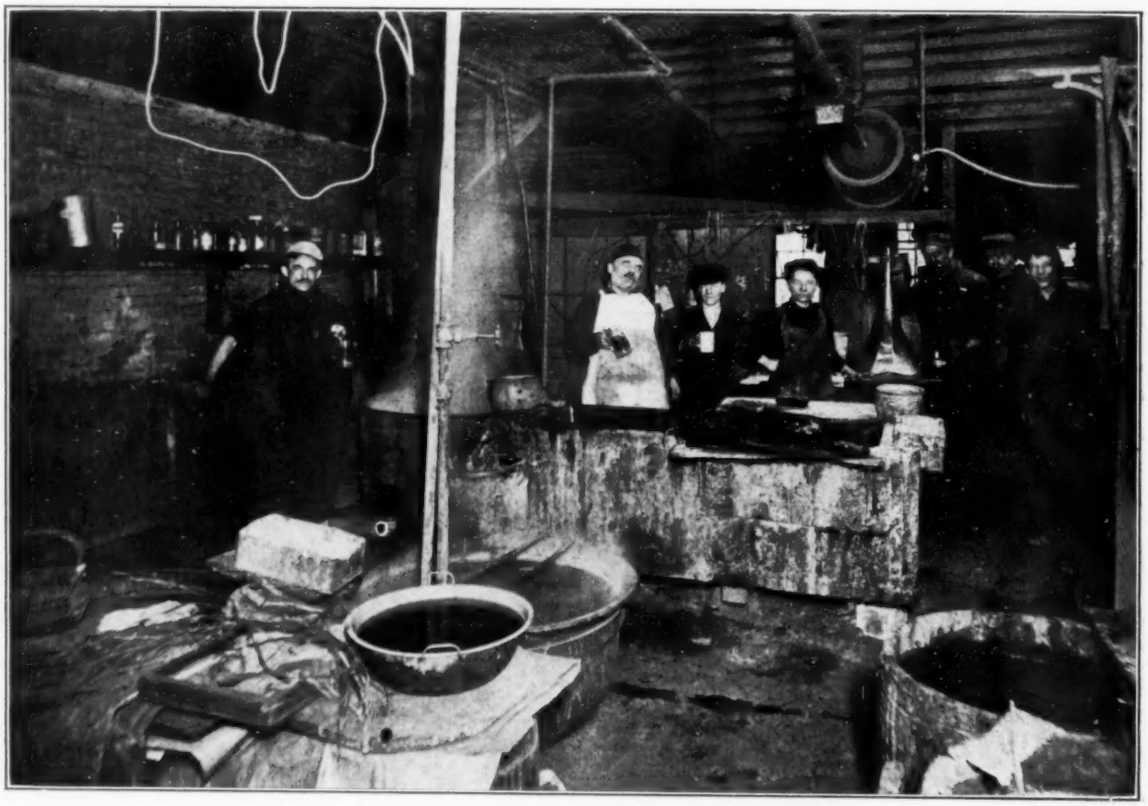
According to Martin Koster, present and sole proprietor, it was established in 1859 by one Slitor, later to be acquired by C. H. Hengst, and, twenty-nine years ago, reorganized by Mr. Koster. Mr. Slitor started the business with a battery of 30 cells, which may give an idea of the extent of the operations in those days. There were only two to operate the little plant, which was located on Champlain avenue, Mr. Slitor and his helper.

When Mr. Hengst took hold he increased the business to the extent of requiring three assistants. Those were in the days when Cleveland was growing slowly. There was little need for the services of the plater; but the business prospered. When the business was taken over by Mr. Koster a battery of 75 amperes was in operation.

Improvement was made at once, and with the improvement in plant operation came increase of business. Today this plant is running on 600 amperes, which gives an adequate idea of the progress in nearly three decades. Mr. Koster continued the business in the original establishment for three years and then moved it to 1232 East Third street, where it has been located now for more than a quarter of a century.

From sixteen to thirty men are employed, according to the amount of business on hand. At the moment about sixteen men are operating in this plant. Specialty of church work is made. It is said the Northern Ohio Plating Works has the bulk, if not all, of this work in Cleveland. Candelabra, chalister cups, sanctuary vessels, altar lamps and similar pieces are handled.

This firm also makes a specialty of fancy and difficult repair work in the church and other lines, and in this branch of the business it has made quite a name for itself.



PLATING ROOM OF THE NORTHERN OHIO MANUFACTURING AND REFINISHING COMPANY. ONE OF THE EARLY SHOPS OF CLEVELAND, OHIO.

Associated with Mr. Koster in the operation of the plant are his three sons, Bernard, Frank and Karl Koster, each of whom is specializing in a different branch of the business.

Central Plating Works, while not among the oldest in the city, is a long-established organization, having been in business for eleven years. It was established by John G. Tenhagen, J. Emil Tuescher and Charles F. Schilling equal partners, who have come to look upon their particular work as an art that requires their personal attention at all times.

Gold and silver plating are the specialties here, according to Mr. Tenhagen, and although this branch of the

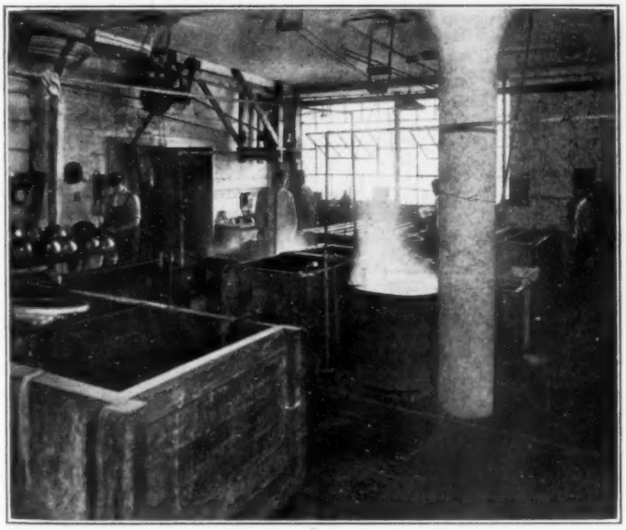
business met with little encouragement at first, it has grown until today the bulk of the gold and silver workers in the city are on the Central's list. This firm is noted for its fine work, such as watch case rims and spectacle frames. While large pieces are taken, this end of the business is not pushed as much as the other. In short, the cream of the work in Cleveland is received here.

This business has been developed to such an extent that the work is coming in rather than being sought.

"The principal difficulty with us, and undoubtedly with other platers in Cleveland," says Mr. Tenhagen, "is the labor question. Not only is it difficult to get men, but

PLANT OF THE GUIDE MOTOR LAMP MANUFACTURING COMPANY, CLEVELAND, OHIO.

one must consider the higher rates of wages demanded now. This, together with the increasing cost of material, particularly silver, may necessitate an advance in prices. I look for an average increase in prices of 33⅓ per cent in June. Such increase is necessary when it is considered that silver, formerly 60 cents, is now 80 cents."



A CORNER OF THE NEW PLATING ROOM OF THE GUIDE MOTOR LAMP MANUFACTURING COMPANY, CLEVELAND, OHIO.

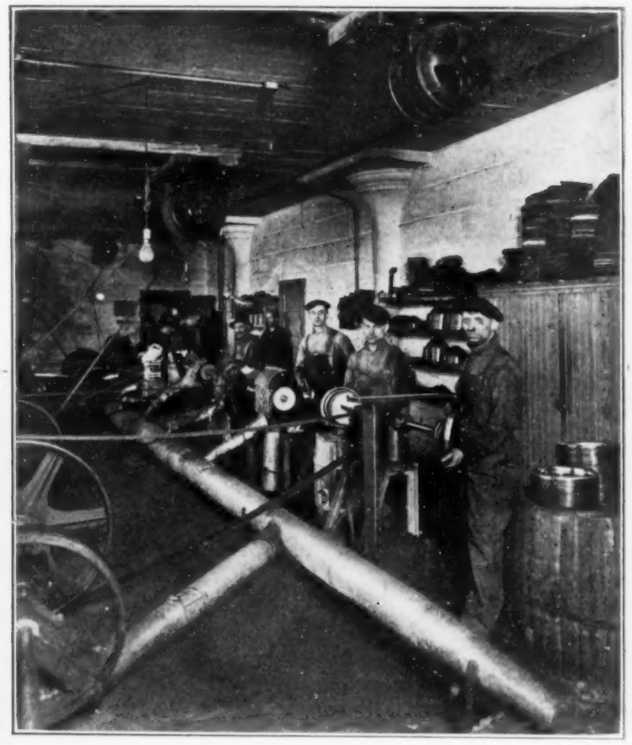
This firm also has the bulk of the band instrument plating business in town. Starting with the three men at the head of the shop, the business has increased until there are not less than ten at work every day.

The Ohio Plating and Manufacturing Company, now at 224 High avenue, is the outgrowth of the business established thirty-two years ago by C. H. Hengst, according to B. Hengst, his son, who operates the new company. The elder Hengst started the business in old Seneca street, but later removed it to East Fourth, in the Gray building. This building was burned down several months ago, and since then the business has been conducted in its present quarters.

"In the early days there was a small battery equipment," says B. Hengst, "but the growth of the city and the demands upon the plating people necessitated the installation of a small plating dynamo. Then they used to run the silver work ten hours, loading up in the morning and running all day, when the batteries were reloaded at night and hooked on ready to operate the following day. At that time all the silver work was hand-burnished, but prices were such that one could afford to do it that way."

The Northern Ohio Manufacturing and Refinishing Company was the predecessor to the present Ohio Plating and Manufacturing Company. Mesh bags, tableware, candelabra and bric-a-brac are the specialties now handled.

With the growth of the automobile industry in Cleveland, and the vast number of cars used and owned within the city itself, has come a demand for accessories not



THE POLISHING ROOM OF THE GUIDE MOTOR LAMP MANUFACTURING COMPANY, CLEVELAND, OHIO.

thought of even five years ago. Important among these is the automobile lamp. In the production of these lamps the Guide Motor Lamp Manufacturing Company occupies an unique position. Eight years ago it was established by three men who did all the work themselves, solicited the business and distributed the finished product. Today the heads of the establishment supervise the work of seventy employees.

A loft in a downtown building sufficed for the output at the beginning. Now the company occupies an entire building at Madison avenue and West 114th street. At that time most of the business was repair work. Now it manufactures exclusively. Among the equipment is a stamping and draw press, said to be unique in many fea-

tures. The plating department is one of the most important, as appearance of all details, and especially the lamps, is essential now with purchasers of automobiles.

The business was established by H. J. Monson, W. F. Persons and William Bunce. Mr. Bunce recently withdrew from the firm. Mr. Monson is now president, Mr. Persons vice-president and J. D. Kauffman secretary and treasurer.

The Standard Welding Company, where electro-galvanizing is carried on on quite a large scale, has twenty-eight tanks with a capacity of 500 gallons each for plating automobile rims. This work is handled by machinery and conveyed from cleaner to pickle and then to plating tanks and after plating to rinse and hot water tanks. They employ seventy-two men in this plating room, in three shifts of twenty-four men eight hours, and turn out 248,000 pounds of work per day. Their generator units consist of two 4,000, two 2,000, two 1,500 and one 6,000 ampere machines. The first two 4,000 ampere generators are direct driven by a motor on the same base, while the other units are belt driven, making in all 21,000 amperes. This place is one of the largest plants for making automobile rims in the world and their work is carried on conveyors, as shown in the pictures, from one floor to another in a continuous stream. These conveyors have pins on them at regular intervals whereon the work is held so that it does not slide off. There are no delays waiting for elevators or loading and unloading trucks, as no such obsolete methods are used in this plant.

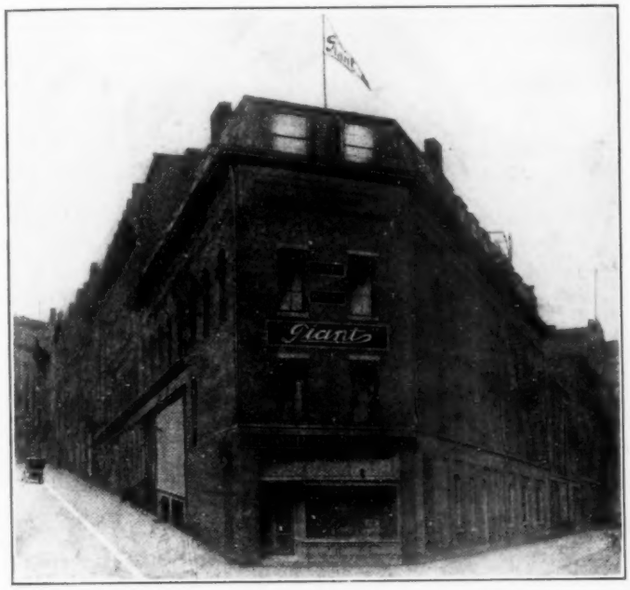
Another place is the W. S. Tyler Company. They make ornamental iron work and have the largest plating room in the city. They plate nickel, brass, bronze and copper, both cyanide and acid, and have very large tanks, some resting on one floor and extending up through the next one to the proper height to work at. The plating room practically takes up two floors in this way, as the generators, which consist of units to the amount of 4,000 amperes, are also on the floor below. The wires come up through the floor at the end of each tank where the rheostats are located as the space overhead is all needed for handling the work which, by the way, is carried from tank to tank on overhead trolley conveyors. On entering this plating room when no work is being done one wonders at the great space between tanks, of which there are forty, "cleaning and plating," but when they are working on some large pieces you will say there is not enough room to properly handle the work—and the amount of work that can be handled is enormous. Their acid copper is agitated by compressed air.

THE OLD PLATING SHOP OF THE GUIDE MOTOR LAMP MANUFACTURING COMPANY, CLEVELAND, OHIO.

The finishing of some of this work is something out of the ordinary and is done by hand with emery cloth. The plating must of necessity be of some thickness, as anyone connected with plating will readily understand.

Still another place that is out of the ordinary is the Cleveland Foundry Company, the "Home of Perfection" oil stoves. They do nickel, copper and brass plating and their generator units consist of one 4,000, one 3,000 and one 1,000 ampere machines. Their tanks are so arranged that the work as it leaves the polishing department is wired up and placed directly on the cathode rods of the plating tank which, by the way, are carried by an overhead conveyor to the electric cleaner to rinse water to plating tank. After plating, to the rinse water, hot water, dryer and then to buffing room, where the work is taken

off and the cathode rods go back to the polishing room side of plating room and get another batch of work and go through the same routine again. As there is no scrubbing almost no help is required in the plating room, considering the enormous amount of work turned out daily. This conveyor is not in use because of the heavy work



THE FIRST JOB PLATING SHOP IN CLEVELAND, OHIO.
On the third floor of this building is the plant of the Valley Plating Works, established in 1883.

but on account of the efficient handling of a great amount of small work. They have in this plating room 33 nickel tanks, 9 feet by 32 inches by 3 feet, holding about 400 gallons each and 500 gallons of copper, in which they run four barrel platers, also one brass tank. Their electric cleaners have a capacity of 450 gallons each and there are four of them. The work consists of ordinary stove work, there being no very large prices.

Then we have the Cleveland Burial Case Company, one of the first places to do plating in Cleveland. They started in 1872 and Denis Leonard, now dead, was their plater, coming from the East. This firm also does large amounts of work, but mostly silver plating.

There are besides this the following places that do plating—some on a very large scale, while others are quite small: The Standard Plating Works, Champion Plating Works, Morreau Gas Fixture Company. This firm manufactures fixtures on quite a large scale and turns them out in all the up-to-date finishes. Mr. Wicks, vice-president of the Cleveland branch of Electro-platers' Society, has a locker in this place and faces the paymaster at regular intervals. The Wicks Plating Company, Martin Brass and Electric Fixture Company, Dangler Stove Company, American Plating Works, Cleveland Plating Works, Cleveland Art Metal Company, Cold Galvanizing Company, Electro-Plating Works, Forest City Plating Works, Union Specialty and Plating Company, Peck, Stow & Wilcox Company (this is a part of a large eastern concern, but this part is one of Cleveland's foremost manufacturing concerns), the Sanitary Company, Columbia Hardware Company, Burke Valve Company, Stearns Automobile Company, Eberhart Manufacturing Company, Winton Motor Car ompany, Fanner Manufacturing Company, Adams-Bagnall Company, Van Dorn Iron Works, National Plating Works, Snider & Trenkamp Company, Tennerman Steel Range Company, National Screw and Tack Company, White Automobile Company, White Sewing Machine Company, Scott, Ullman & Co. This is the place where our president, Mr. Scott, has charge and is by no means a small place. They manufacture gas and electric fixtures in all the swell finishes. Taylor & Boges Foundry Company, B. & B. Manufacturing Company, Standard Sewing Machine Company, Globe Machine and Stamping Company, Crescent Brass Company, C. H. Collings Company. This place might truly be called the alchemist's shop, as everything that can be turned out of a plating room comes out here, and nothing but the best in their line. Our own Mr. Werft, secretary of the Cleveland branch, is chief chemist. Franz Premier Vacuum Cleaner Company, Lake

PART OF THE PLATING ROOM OF THE W. S. TYLER COMPANY, CLEVELAND, OHIO.

Shore Railroad, Burr Manufacturing Company, H. W. White Musical Instrument Company, Regar Brass Manufacturing Company, Russ Company, Royal Brass Manufacturing Company, Reliance Gauge Column Company, Sterling Brass Manufacturing Company, United Brass Manufacturing Company, U. S. Dental Supply Company, K. W. Ignition Company. This place is known wherever automobiles are known and our librarian, James Purcell, presides over the plating department. Virdin Brass Manufacturing Company, Victor Brass Manufacturing Company, Willard Storage Battery Company, Zirk Manufacturing Company, Eclipse Plating and Manufacturing Company, Ohio Manufacturing and Plating Company, Atlas Brass Manufacturing Company, Cleveland Motorcycle Company, American Multigraph Company, American Brass Company, Appex Electric Manufacturing Company, Art Metal Manufacturing Company, Bentley & Dilley, Bishop, Babcock & Becker, Cleveland Tack Company, Born Steel Range Company, Buckeye Fixture Company, Cleveland Welding and Manufacturing Company, Cleveland Cyclone Fence Company, Central Brass Manufacturing Company, Cleveland Co-operative Stove Company, Cleveland Fare Box Company, Crane Fence Company, Cochrane Brass Manufacturing Company, Champion Stove Company, Cleveland Metal Stamping Company, Cleveland Dental Supply Company, Cleveland Metal Products Company, Dell Manufacturing Company, Draper Manufacturing Company, Electric Control and Manufacturing Company, Empire Brass Manufacturing Company, Euclid Avenue Fixture Company, Federal Brass Manufacturing Company, Frost Superior Fence Company, Glauber Brass Manufacturing Company, Variety Art Metal Company, A. L. Donze, National Safe and Lock Company, Bomgarden Manufacturing Company, Cleveland Galvanizing Company, Cleveland Central Galvanizing Company, P. A. Geier & Co., Globe Brass Manufacturing Company, Gas Fixture and Brass Company, Imperial Steel Range Company, E. Konigslow Stamping Works, Otto Konigslow Company, Langarien Manufacturing Company, Mirroscope Company, National Carbon Company, Products Plating Company, Asher Manufacturing Company, Bickersburgh Brass Manufacturing Company, Sixth City Plating Company, Manufacturers' Plating Company, Upson Nut Company, Wilson Dress Fastener Company, Cleveland Electro-Lead Plating Company, and perhaps a few more that have been overlooked.

BEGINNING OF THE "JOB SHOP."

In 1875 there were in Cleveland just four places where plating was carried on. The White Sewing Machine Company was perhaps the first, starting in 1872. The Cleveland Burial Case Company was second. The Cleveland Parlor Grate and Foundry Company and the Cleveland Non-Explosive Lamp Company made up the four places.

In 1883 the Cleveland Parlor Grate and Foundry Company went out of business and Mr. Swartz, their plater, bought the plating department and set out in the job plating business as the Valley Plating Works, the first job shop in the city, at 46 South Water street, corner of Champlain avenue. The name of South Water street has since been changed to Columbus road, and the number now is 1591 Columbus road. The building is the same one that Mr. Swartz started in, occupying the third floor for thirty-three years.

THE CONVENTION PROGRAM.

Now as to the convention proper. The program as at present outlined will be a little departure from previous conventions, as we do not expect to spend so much time on our business meetings, but more time on papers and discussions and some diversion, which is what we think the membership at large wants. Besides, we will have an intermission, so that the members can take the ladies out, and, as most visitors have some special place to go that would not be of any interest to the members at large, this gives them their chance to do so and not miss any of the work of the convention.

The program follows:

THURSDAY, JULY 6.

8 a. m.—Registration and distribution of badges, Statler Hotel.
9 a. m.—Meeting of Executive board and Credentials committee.
10 a. m.—Opening session of convention. Report of Credentials committee. Business session. Reports of Officers.
2 p. m.—Papers and Discussions. At this time four papers will be read and discussed.
8 p. m.—Papers and Discussions. At this time 4 papers will be read and discussed.

FRIDAY, JULY 7.

8:30 a. m.—Business session. Election of Officers for 1916-17. Selection of next convention city.
2 p. m.—Intermission. Take the ladies out; you say where; they will tell you.
8 p. m.—Papers and Discussions. Four papers will be read and discussed.

SATURDAY, JULY 8.

8:30 a. m.—Assemble at Hotel Statler for visits through some of Cleveland's factories.
2 p. m.—Assemble at Hotel Statler for automobile sight-seeing trip through Cleveland.
7 p. m.—Annual Banquet at Hotel Statler. Installation of Officers. A symposium of papers specially selected for this occasion and diversions.

It is intended that the convention be an open one and all manufacturers, superintendents, platers and others that are interested in plating or lacquering will avail themselves of this opportunity to see what can be accomplished by the plater.

The convention committee announces that it has been decided to place the convention on a business basis by charging the delegates and visitors a small sum to cover banquet and entertainment expenses, following the precedent established at Dayton last year; but as there has already appeared in the monthly bulletin an error as to the amount, we wish to say that it will be less than stated.

We are also going to endeavor to get stenographic reports of all the discussions taking place and publish them together with the papers in the monthly bulletin.

EXHIBIT ARRANGEMENTS.

It is the intention to have a larger exhibit of work done by the members of the society than was ever shown before. Richard Slitor, who has charge of the exhibits, says there will be plenty of space for samples, also for manufactures and trade papers, but no power for demonstrations. In sending samples address them American Electroplaters' Society, Hotel Statler, Cleveland, Ohio. They can be sent any time after June 25. Any information regarding this matter will be gladly supplied by Richard Slitor, 8809 Hough avenue, Cleveland, Ohio.

HOTEL STATLER, CLEVELAND, OHIO CONVENTION HEADQUARTERS.

PREVENTIVE MEASURES AGAINST SPOTTING OUT

AN EXHAUSTIVE ARTICLE WHICH IS THE LAST WORD IN THIS ANNOYING PROBLEM

Written for THE METAL INDUSTRY by FRED OTTMAN, FOREMAN PLATER.

(Continued from April.)

PORES AND CRACKS.

Now let us see what we have to expect in pores and cracks of defective castings, and how boiling solutions still find their way into the cavities. If a crack occurs while the metal is submersed, say in the pickle or an acid dip, it constitutes an absolute vacuum, and atmospheric pressure immediately fills it up with the surrounding medium, the acid. If air goes down into the mould with the molten metal, it is of a very high temperature, and still hot, when the metal closes up around it and solidifies. After it has cooled down with the casting, it occupies a larger space than it would under normal atmospheric pressure. Should the pickle or an acid succeed in eating through, atmospheric pressure again will force some acid into the hole, reducing the retinue of air to its normal volume. These, however, are exceptional cases; as a rule, the cavities will either be open from start, as pit, and blowholes, or laid open in machining and polishing, and thus filled with air, when the articles arrive in the plating room. Capillary attraction may have drawn some fluid into the entrance-channels to the apertures, as far as they are narrow, but this is rather insignificant, as long as the main cavity remains dry, for the expansion of the enclosed air will blow it out, when the articles are heated. The air will also expand further, and part of it extrude into the boiling liquid, generally some hot lye, electric cleaner, etc., used as first step in preparing the work for plating and oxidizing, but nothing can get inside, for the remaining air, though rarified, is still the equal of the external atmospheric pressure and guards the narrow inlets. On cooling, it recedes, and having considerably expanded in the hot solution, hence lost a correspondingly large portion, makes room for a relatively large quantity of some other substance, usually some liquid. The next heating finds now the liquid in the cavity, and as the expansion of liquids in the average is only one-fourth that of a gas we will have to repeat the heating four times in order to force out a volume equal to that we have allowed to enter in the first cold plunge, and then we have only extruded the same volume, not the same liquid, for gradually it mixes with the new fluid, and more and more of the latter is contained in the subsequent extruding quantities of liquid. We understand now why it takes so many operations to make good the first misstep. But this does not explain yet the presence of potash in pit-holes, which the writer has already admitted. Potash is always used hot. Should the old theory be true, neverless? Every plater knows how tenaciously alkaline solutions cling to the skin, when he happens to dip his hand into soda, cyanide, etc., and how difficult it is to wash them off in plain cold water. The same slimy and thick coating of potash he carries upon his hot work into the cold rinsing water. It covers the entrances to the cavities, the cold water does not take it up as quick as the metal cools off and the air in the cavities recedes and makes room for the water; so when the water rushes on, the potash slips in ahead of it. The plater must therefore make it his first rule, never to rinse articles coming from a hot alkaline cleaning, oxidizing or plating solution, in cold water, he must remove the adhering solution while the metal is hot and the contents of the cavities expanded, that is in hot, if possible boiling, water. Then, when the surface is clean, he must plunge the work into clean cold water, cool off the metal and fill up the holes with the cold water before he proceeds to the cold cyanide dip or some other cold solution. Would he go into the latter directly with the hot articles, he would force this into the apertures. A direct change, where otherwice permissible, is only harmless when both solutions are hot, both cold, or the second one warmer than the former. If these two rules are carefully followed, it is almost impossible to get anything but clean water into the cavities, which ultimately can be evaporated without even tarnishing the edges of the apertures. If the plater wants to go absolutely sure, he

PLANT OF THE STANDARD WELDING COMPANY, CLEVELAND, OHIO.

will fill the pores of articles showing a tendency to spot, with clean water right in the beginning. This will require two operations only, where afterwards a dozen are required. Solutions of any kind (aqueous solutions, of course), have a higher boiling point than water, and cannot be converted into steam in boiling water, but the latter can. Immersing the fresh and dry articles, after wiring, into boiling water, we drive off a good deal of air out of the cavities; a quick plunge into cold water, without allowing the metal to cool off in the open and take in air again, forces water into the cavities. Returning the objects now to the briskly boiling water, we produce steam which, being heavier, forces the remaining air out and, upon condensation in the cold water, creates an absolute vacuum, that fills up completely with water in this second cold plunge. (The same principle is applied in creating the vacuum in the thermometer tube over the mercury.) Heavy castings may require a minute, sometimes more, till they have assumed boiling temperature, thin shells may be dipped in quick succession. The first heating may conveniently take place upon the heater, thus requiring no attendance, the re-heating better in boiling water to avoid a drying out in the pores. Subsequent solutions will now find little opportunity to invade the cavities, and where they succeed, they are immediately diluted. Where they find an easy way to enter, water also will, and wash them away again afterwards. The precautions aforementioned, however, should nevertheless, not be neglected, whether the cavities have been flushed with water, or not.

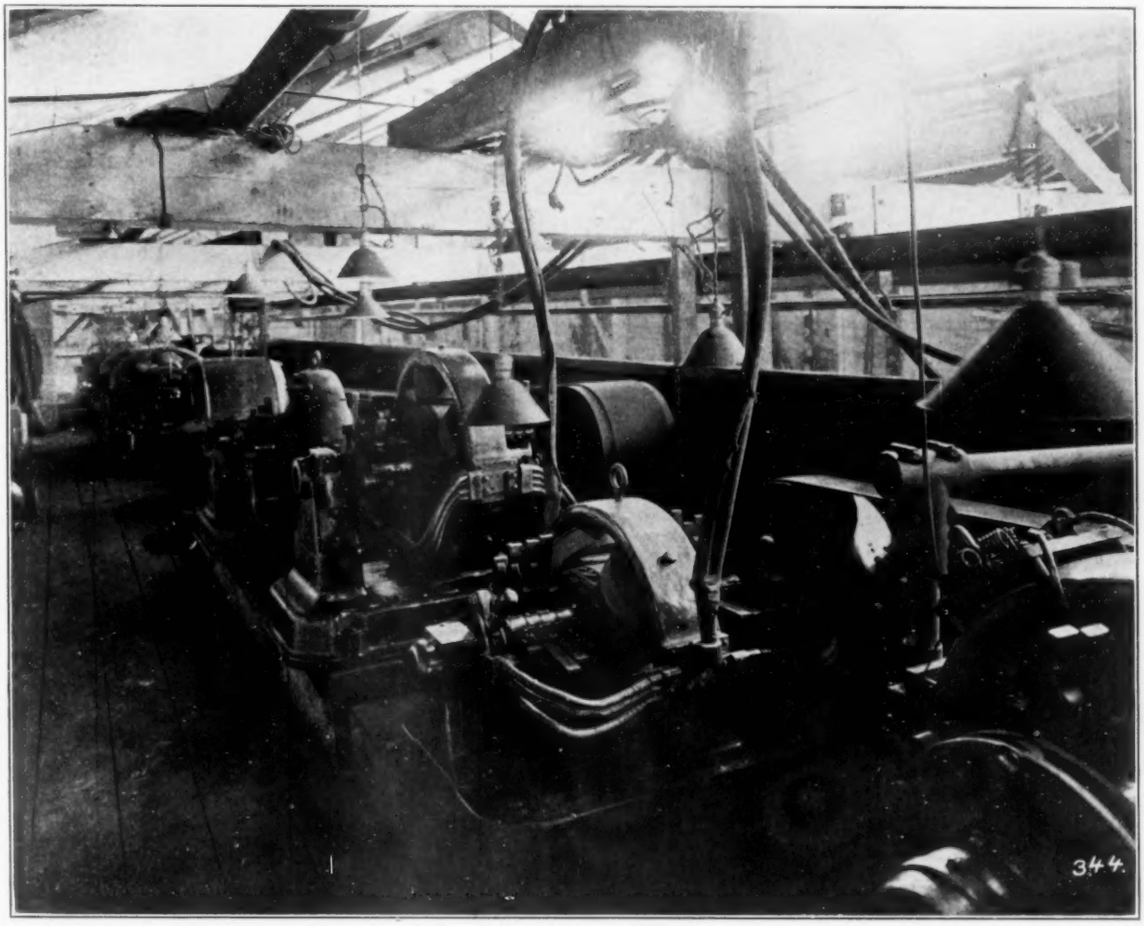
It was interesting to read the reports of several experienced platers, how they prepare their work for plating; one neutralizes his acid in hot lye, the other his lye with an acid. Both claim success, and the reliability of either method is disputed by others, on the strength of their own experience with exactly the same methods. Both who claim success and freedom from spotting rinse off their lye in hot water first, before they pass the work on to the cold water tank. The others do not give any details, but it is not unlikely that they have overlooked just this one little, but very essential point, or even thought themselves wiser and "squeezed out the hot lye by one single plunge into ice-cold water," and spoiled everything.

CENTER ROW OF TANKS IN PLATING ROOM. THERE IS A SIMILAR ROW ON EACH SIDE. PLANT OF THE STANDARD WELDING COMPANY, CLEVELAND, OHIO.

When the destructive substance has already taken possession of the cavities, there are two ways open as a definite cure, we either gradually substitute water for the obnoxious solution and evaporate this, or we change the harmful substance into an inert one and leave this in the metal. The second method is naturally the shorter one, but in both instances the main feature of the problem is mechanical, the difficulty of dislodging the original tenant. We have seen that we can expand the enclosed solution beyond the capacity of the cavities by raising the temperature of the article, that a part of it then extrudes and is lost in the surrounding hot fluid. (If we would heat the object in

dry air, we would only evaporate the moisture and leave all of the objectionable substance behind). If we now allow the article to resume the former temperature, there is less liquid left in the cavities, it does not fill them completely, and if the cooling off takes place in some cold liquid, this takes the vacant space, mixes with the remaining old stock, and eventually reacts with it chemically. The greater the difference in the temperature between the hot and cold solutions used, the higher the effect of each single exchange. Where a chemical reaction is intended, the remedy must be added to the *cold* solution. This is rather to leave it to the subsequent reheating, we might force the remedy out again, before it has found a chance to act at all.

Concerning a chemical attack upon the obnoxious compound, we must, first of all, know its true nature. Sometimes it is an acid; cracked castings have been taken, for a test, right from the pickle, rinsed, dried, polished, wiped clean, and lacquered—they spotted out. Cyanide is most often considered responsible for spotting; it may be, when the articles are plated in a hot solution and then rinsed cold. Caustic alkalies are highly deliquescent and sure supporters of spotting;

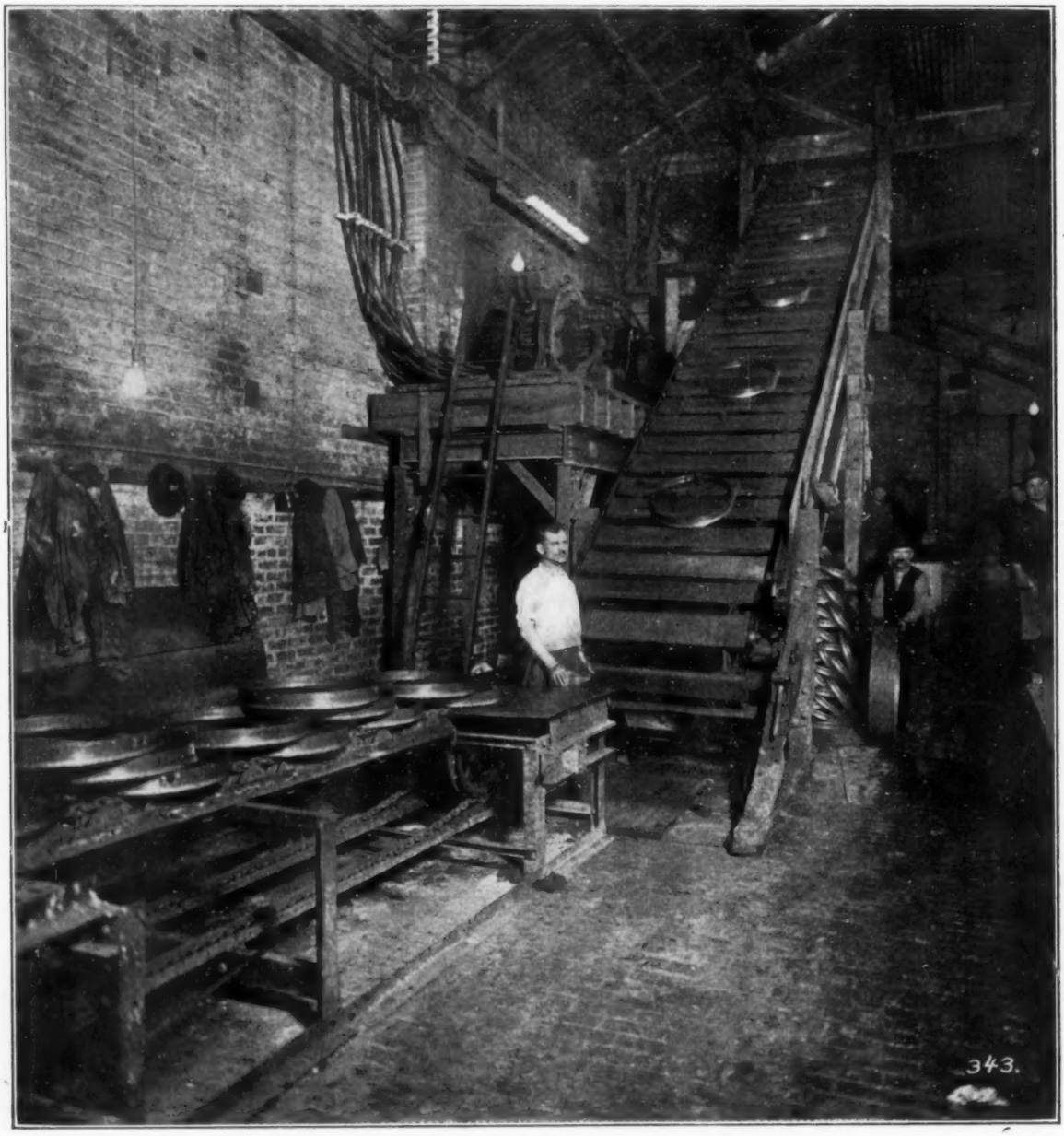


A PART OF THE GENERATOR ROOM AT THE PLANT OF STANDARD WELDING COMPANY, CLEVELAND, OHIO.

favorable, for it allows the use of substances and concentrations, which at higher temperatures might attack the metal. A few points must still be kept in mind to insure a complete success: heavy, compact objects must be allowed time to fully assume the temperatures of the two alternating solutions; no time must be lost in transferring the hot article to the cold solution and immersing it before the cooling off sets in, else we get air into the cavities instead of the cold fluid; the return from the cold to the hot solution, however, must not be hastened so much; the cold fluid must be allowed time not only to enter, but also to mix, eventually react, with the original solution; when chemical reaction is intended, it is advisable not to go too low with the temperature of the cold curing solution, for the lower the temperature, the slower chemical reaction, if it takes place at all, and if we thought they are always used boiling, and when cold rinsing follows, they may do the trick the cyanide is blamed for. Mercury is a very bad spotter on cracked and pitted metal, as the fire-gilder very well knows, and it is not impossible that dull spots appearing upon polished silver surfaces may sometimes be due to too liberal a use of the mercury dip, not to the silver solution. Sometimes it is the acid, at other times the base of the salt, which makes it deliquescent, sometimes not the salt at all, but small casual contaminations, that give it this property. Sodium chloride, for instance, exhibits very little tendency to attract moisture; yet we find our table salt frequently quite damp. The trouble is due to small quantities of calcium and magnesium chlorides it contains. The plater adds magnesium salts to his solutions as a brightener; in doing so he may innocently invite trouble. It is not

necessary that any one of the compounds he adds to his solution must be deliquescent and give a warning, the deliquescent combination may form right in the solution by exchange of constituents between the different salts present. Lately the plater has perhaps been wondering what makes his liver of sulphur run; it used to stay dry, even when exposed to the atmosphere. The present scarcity of potash has compelled the manufacturers to substitute sodium sulphide for the potassium sulphide formerly used. It is an analogous compound, does the same services as an oxidizing medium, and rightfully passes under the same name; but it is highly deliquescent and may become a new source of trouble, particularly when the solution is used cold and the articles heated, instead, in boiling water in order to insure quicker action of the dip or deeper tints. We see, the plater can never be too sure that any one of the solutions he uses is not harmful, and whenever the character of the work he handles makes it appear liable to spotting, he should not neglect the precautions mentioned; then he can use almost any solution safety.

Returning to the question of chemical action upon the disturber, complete precipitation in an insoluble form is the most appealing, because it offers the most thorough solution of the problem. Presuming that cyanide is the only or foremost supporter of spotting, nitrate of lead has been suggested as a cure. This is perhaps the most unfortunate proposition that could have been found. It is true, lead forms only a single cyanide (no double cyanide, as the author of the suggestion hints at, which would revert it again into soluble form), hence remains insoluble even when a remainder of free cyanide is left behind. But the hot lead solution, which the author,



STANDARD WELDING COMPANY, CLEVELAND, OHIO. CONVEYOR CARRYING WORK TO ANNEALING FURNACE FROM WHICH IT GOES TO PLATING DEPARTMENT TO THE RIGHT OF CONVEYOR.

laboring under the old mistake, means to force into the cavities, is very likely to decompose upon the metal, particularly if this contains zinc, and tarnish it beyond repair. Furthermore, suppose we would succeed in forcing the lead solution into the pores in some way, what is gained? The metal of the double cyanide originally present goes down as single cyanide, the lead combines with the hydrocyanic acid of the free cyanide present and that of the alkali in the double cyanide, and goes down also. And the nitric acid of the lead nitrate? Squeezed out by a single plunge into ice-cold water? It combines with the liberated alkali, forming saltpeter, a powerful oxidizing agent and perhaps more proficient in spotting than the original substance. We must not lose sight of the by-products we create. It is, however, quite unnecessary to go begging so far for a compound, that will do us the favor of precipitating that bad cyanide. We have them abundantly on hand in the smallest plating room. If we pour a few drops of copper sulphate into cyanide solution, the blue color disappears, but no precipitate forms, or if one forms locally for a moment, where the two solutions meet, it immediately disappears again. The copper combines with an appropriate portion of hydrocyanic acid from the cyanide, and the new product associates itself with a corresponding amount of free cyanide, forming a colorless double salt, which is soluble in the water of the solution. This keeps on as long as there is any free cyanide left to combine with the appearing cyanide of copper. The next drop of copper solution will now produce a precipitate, but no color yet. It claims an adequate portion of hydrocyanic acid from the alkali in the double cyanide, and finding nothing to combine with, goes down as insoluble single cyanide of copper, taking down with it the portion of copper cyanide it has separated from the associated alkali cyanide. This again keeps on till the last molecule of alkali cyanide has been removed from its combination with copper cyanide and decomposed. We have now a precipitate of cyanide of copper, and a solution of sulphate of alkali, which forms no combination with the former; in other words, is no solvent for the copper cyanide. The next drop of copper solution retains its color, the two solutions merely mix, no further chemical reaction takes place. Had we stopped the addition of copper sulphate in the moment the first permanent precipitate appeared, or at any other time, and continued instead with the addition of some other metallic salt, say nickel chloride, zinc sulphate, silver nitrate, the result would have been the same, only we would then have a mixture of the insoluble cyanides of the two metals used (not a "double cyanide," though, in this case), and a solution of either alkali sulphate straight, or sulphate and chloride, sulphate and nitrate. No free alkali nor free acid will be found in the solution, for the metallic salt gives up its acid to combine with the alkali at the same rate, in which it sets the alkali free. Whether the metal chosen forms a soluble double cyanide, like those used in the plating solutions, or not, and whether we use a salt of the same metal, or metals, the plating bath contains, or some other one, is absolutely irrelevant; we obtain an insoluble precipitate of single cyanide of the metal or metals, and bind all the hydrocyanic acid present, if we only use a sufficient amount of metal; furthermore, we have to add just as much of any other metal, as we would need of lead nitrate; by weight even less, as the lead salts are heavier than those of the metals usually handled in a plating room. All the plater has to do is rinse his work, when he takes it out of the cyanide plating tank, and then dip it into his nickel,—or sour copper solution, and if he rinses hot, or heats his work in boiling water, before he immerses it into the cold sour or, better, neutral solution, he can be sure that he forces the latter actually into the cavities, what an immersion in a hot lead nitrate solution never would accomplish. He need not be afraid of finding his work tarnished, either, when he takes it out of the cold metallic solution. The latter, of course, will first attack the free cyanide of the plating bath and form some more soluble double cyanide; if it contains free acid, this will even decompose a corresponding quantity of alkali cyanide, both of the free and of the combined cyanide of the double salt, and remove some of the hydrocyanic acid by volatization, but ultimately we might have some free acid in the cavities, so better use a neutral solution. When all the free cyanide has been used up in the formation of double cyanide, the precipitation of insoluble single cyanide begins. It might seem more economical to use a metal which does not form a double cyanide, such as the proposed lead salt; then the precipitation begins at once, and no metal is lost in the formation of double cyanide. The advantage is only imaginary. We have seen that when the double cyanide begins to split, two portions of single cyanide come down, that formed by the new addition of metal and that already present and now deprived of the associated alkali. The ultimate consumption of metallic salt is in direct proportion to the total amount of alkali cyanide present both in the free state and as part of the double cyanide. If we use a metallic sulphate solution for the precipitation, the only by-product we obtain is the sulphate of an alkali, dry salts, which may remain in the cavities together with the precipitate.

(To be continued)

ELECTRO-PLATING FACTORS

NUMBER OF AMPERES REQUIRED TO DEPOSIT ONE POUND OF METAL PER HOUR.

Copper—1 pound of metal deposited per hour requires	386.4	amperes.
Gold—1 pound of metal deposited per hour requires	185.8	"
Nickel—1 pound of metal deposited per hour requires	412.8	"
Silver—1 pound of metal deposited per hour requires	112.7	"
Zinc—1 pound of metal deposited per hour requires	400	"

The voltage or pressure required differs with the various metals thus:

VOLTAGE REQUIRED FOR PROPER DEPOSIT.

Brass	4	to	6	volts.
Copper (Sulphate)	.5	"	1.5	"
Copper (Cyanide)	3	"	5	"
Gold	.5	"	4	"
Silver	.5	"	1	"
Zinc	3	"	5	"
Nickel at first 5 volts and diminishing to	1.5	"	2	"

QUANTITY OF CURRENT FOR PROPER DEPOSIT.

	Amperes per sq. ft.		
Brass	4.3	to	5
Copper, typing, good solid deposit	14.4	"	36
Copper cyanide	2.9	"	4.3
Gold	.71	"	1.44
Silver	1.4	"	4.3
Nickel, begin with 9 to 10 amperes per 100 sq. ins., diminishing to	1.4	"	2.9
Zinc	10	"	20

If solutions are agitated, the current density can be doubled, and in some cases trebled.

DESIGN AND WHAT IT MEANS

A Philosophical Discussion on the Development of the Creative Faculty to Produce Objects of Beauty.

Written for The Metal Industry By A. F. Saunders, Designer.

What is a design? the term Design implies more than "the rendering of a drawing, a sketch, a delineation," as defined in our dictionaries.

The development of a creative faculty as demanded in the production of a design is quite a different task from developing the faculty of observation required to make an adequate drawing, sketch or delineation of a design. It was John Ruskin, I believe, who once said that, "drawing may be taught by tutors; but design only by Heaven," a truer saying was never expressed. We may be taught to observe things placed before us and to make an adequate, perhaps a beautiful and artistic representation of what we see, but to actually create a design that fulfills in a practical and aesthetic manner the particular purpose for which it is conceived demands a pretty thorough knowledge of the various constructive elements, a keen sense of proportion, and a liberal supply of that subtle quality called good taste.

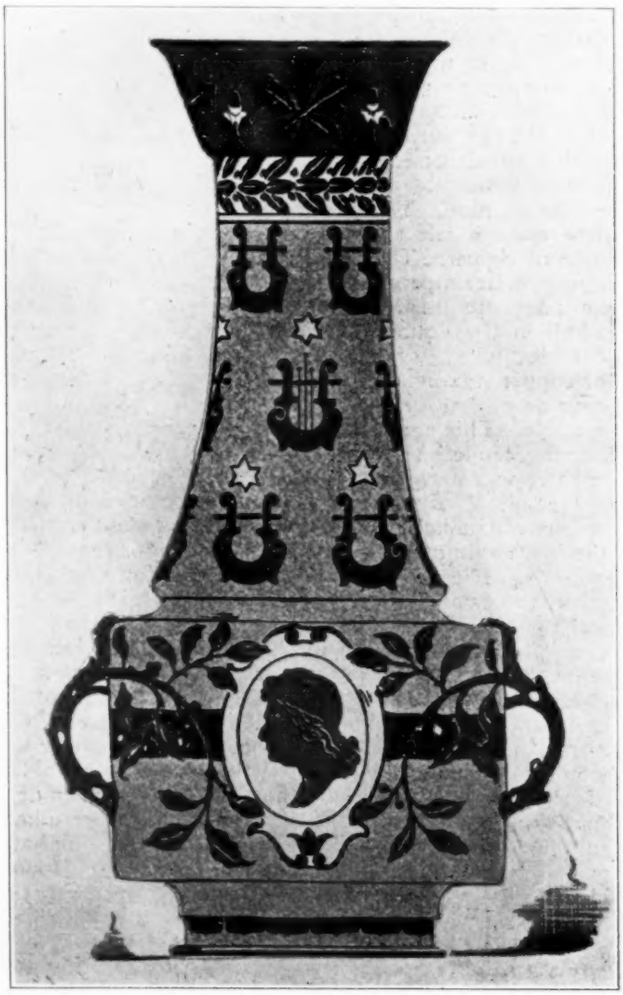
ATHENS BRONZE VASE.

Example of design along lines of accepted principles:
1.—Good in outline.
2.—Simplicity of decoration.
3.—Appropriate decorative motif.
4.—Unity of form and ornamentation.

Firstly, a design is a tangible and definite expression of an idea.

Secondly, the term design implies an interesting, possibly a beautiful or at least an orderly rendering of this expression.

Thirdly, to create a design we must of course first have an idea, then the power of imagination to conceive how the idea will appear in the material of which the design is intended to be executed.



EXAMPLE OF POOR DESIGN.

1.—Bad in outline.
2.—Over ornamental.
3.—Inapproprial decorative motif.
4.—Lack of harmony between form and decoration.

Fourthly, the designer must have the ability to commit himself at once to definite lines, forms and variations, the result will be beautiful in direct ratio to his appreciation and understanding of the principles underlying line, form and composition.

In creating a design of an object for the purpose of

ornamentation it is obvious that it should appeal to one's sense of beauty, it must be beautiful in order to inspire us with a feeling of admiration, thus creating a desire to possess the finished object of whatever material it may be formed.

This brings up the question, what is beauty? And how are we to know it when we have achieved it? An object may be pretty, stylish and elaborately embellished, yet lack all the essentials of real beauty. Beauty has never been defined, it has no period, style, or country; yet it is universal, it is often found in the most insignificant of things, in the most obscure places. We find it in the basket work of the savage whose whole life has known no other horizon than the line of the desert mesa tops, we find it at times in the simplest forms of nature, it is found in the unearthed ruins of the ancients in a form so enduring that time, war and pillage have failed to efface it.

We do know, however, that a beautiful thing, whatever it may be, is invariably sane and orderly in arrangement, clear and coherent in conception and expression, straight-forward in an acceptance of all the conditions and requirements imposed by question of utility, environment and materials.

We seek to express our ideas of the beautiful through design, guided by certain principles which have proven fundamentally right and a certain intuition which years of careful study and practice have developed within our minds.

To some people's minds an ornament is merely a piece of bric-a-brac, designed to appear beautiful but serving no particular purpose of usefulness other than to help decorate and fill up space on the mantle shelf, the table, or perhaps some odd corner in the room. Considered from this narrow point of view an ornamental object becomes not a feature of decorative harmony in the general scheme of furnishing the home, but falls into the category of a seemingly pretty but nondescript unit of decoration, often totally disconnected from an otherwise beautiful and artistic environment.

To be really ornamental an object must be not only beautiful in itself but it must make more beautiful its surroundings, it should also fulfill a purpose of usefulness; utility and beauty are perfectly compatible; there is no good reason why the possession of one should condone the lack of the other in any object.

That the designer of art metal wares should know how to apply these principles is obvious, for of all the various articles created to fulfill both an ornamental and useful purpose in the furnishing of the home, none is of more importance than the numerous objects formed of metal designed to do their part in carrying out the decorative art of the home. The table silver, the metal articles for use on the desk, even the hardware on the doors, are all things that we live with day after day, like the pictures on the walls, the furniture, the rugs and draperies, these things all have a far greater influence in cultivating our tastes along aesthetic lines than most people realize.

During the last quarter of a century there has come, through increased leisure and wealth a greater demand for beauty and artistic worth in the things that adorn our homes. We have developed a far greater understanding and appreciation of the artistic. This has been brought about by our closer touch with the art centers of the world, and largely through the untiring efforts of our designers and art craftsmen. In no direction has this influence been more noticeable than in the art metal work produced in our factories of today.

There are those who contend that true art value exists only in such works as are designed and executed by the art craftsman himself, every part of the work being carried out by his own hands. This is the view of the extremist, for where there is one man with the creative power to design, there are a hundred, yes, a thousand workmen who can interpret his designs. Were we dependent solely upon the output of strictly hand made wares, their necessarily limited production and high price would place them out of reach of the majority of people; therefore it is obvious that factory organization is indispensable and it is directly up to the designer to have his designs possess originality of idea combined with sound principles of art.

A FORMULA TO BE RECOMMENDED FOR USE FOR A SOFT HAMMER

By G. C. Holder.

Oftentimes around large shops where soft hammers are used extensively a perplexing problem arises as to the best material available for such use.

Babbitt or soft hammers are often subjected to hard usages, such as driving pins and fitting brasses on machinery. At times they are used as wedges and are subjected to heavy blows from sledges.

Various forms and mixtures are used for soft hammers, such as lead in chunks, lead encased in annealed copper tubing, lead hardened by antimony. However, none are satisfactory, lead alone being too soft, and when the alloy is encased in annealed copper, the copper will make a mark on the finished casting.

The most important features in choosing material for a good soft hammer are hardness and elasticity. The lead is too soft for good service, and the lead and antimony alloy when not encased chips or spawls too easily. Chipping is a bad feature, because frequent injury to workmen is caused because of flying chips.

Genuine babbitt is sometimes used for hammers of this kind, but it is not entirely satisfactory because of the element of chipping.

(1) A Genuine Babbitt of the following composition:

88.89 % tin
7.40 % antimony
3.70 % copper

has the following physical properties:

7,030 pounds per sq. in. at elastic limit
9,620 " " " " " ultimate "
4 % elongation in 2 inches
22 Brinell hardness number.

(2) An alloy composed as follows:

64.75 % tin
33.00 % zinc
2.25 % copper

has the following physical properties:

5,991 pounds per sq. in. at elastic limit
11,540 " " " " "ultimate "
28 % elongation in 2 inches
29 % Brinell hardness number.

A comparison of the physical properties of the two alloys shows that (2) is somewhat harder than (1), but (2) has 7 times more elongation than (1), which as before stated is a great factor when choosing material for hammer purposes. Then, too, it will give 4 times as long a service as (1) and is easy to cast and runs well.

THE MANUFACTURE OF ADMIRALTY GUN METAL IN ENGLAND

SOME NOTES REGARDING THE PRODUCTION OF THE BRONZE 88 COPPER 10 TIN AND 2 ZINC NOW SO MUCH IN DEMAND FOR WAR PURPOSES.

BY H. S. PRIMROSE, M.T.M.*

(Continued from May.)

PREPARATION OF GUN METAL.

The lighting up of the furnaces is simply accomplished, and the layer of coke between the furnace lining and the crucibles being only a few inches, the melting is very economical in fuel. Thus one 25-pound charge of coke is usually sufficient to melt 120 pounds of gunmetal. This type of furnace enables the labor of handling the hot crucible to be reduced to a minimum, as the shank for lifting the pot is always left in position, and only requires to be raised when the furnace is opened in order to transport the crucible to the casting floor. As a rule, very little coke is left in the shell, and the workmen are protected from the radiant heat of the lining by means of two folding flaps. During the melting the fumes which escape should be lead into a hood in connection with a suction fan.

The fuel used for these types of furnaces is always coke, and it should be selected so as to have the highest possible amount of fixed carbon, as it is upon this that the heating power depends. It is advisable to ensure that the amount of ash left on combustion should be as small as possible and infusible. Otherwise the ash may leave an adherent clinker, which necessitates a frequent relining of the furnace and serious wastage of the fire bricks, besides giving constant trouble in keeping the fire-bars clear for the passage of air. Excessive ash may also cause serious damage to the crucible by causing them to fuse on to the furnace bottom, in which case an expensive breakage is almost sure to occur when the pot is drawn.

There are many varieties of coke-fired furnaces which are made so as to completely obviate the handling of the crucible. This necessitates the body of the furnace being able to tilt so as to allow the contents of the crucible being poured through a spout into a casting ladle, or, if the furnace carriage is laid on a suitable track, the pouring may be made direct from the crucible into the moulds. Other types with removable bodies are sometimes more convenient, as in this case the furnace may be lifted completely off its stand or mounting and transported bodily to the casting floor, being thus used without the intermediary of a ladle.

GAS-FIRE FURNACE

Some melters have the objection to solid fuel that frequent additions of cold fuel are necessary to attain a final high temperature, and this makes it impossible to maintain a uniform heating over any great length of time. Accumulations of ash are deleterious to the furnace and the crucible, and loss of fuel may take place through the fire-bars in clearing the air inlet. By the use of gaseous or liquid fuel these objections are largely overcome, but as a rule gas firing is very expensive if coal gas is used extensively. This cost is almost prohibitive for continuous melting, and if producer gas is utilized, this necessitates the erection and upkeep of a gas producer, which usually does not pay unless other use is made of the gas. In some districts of large metallurgical importance, producer gas of high calorific power is laid on by mains like ordinary coal gas, and can thus be supplied at a sufficiently cheap rate to make it worth while using gas furnace, but such favored localities are few and far between.

*Metallurgical Engineer to the Crittall Mfg. Co., Ltd., Braintree.

OIL-FIRED FURNACES

With the introduction of heavy oil for burning in metallurgical furnaces, the great advantage of using it for melting gunmetal and non-ferrous alloys generally was very quickly recognized, especially in the country districts where coke supply is scarce and methods of gas production were comparatively dear. The oil is much more convenient to handle than coke, although it may be somewhat less clean, but it possesses the great advantage of being very simply regulated when fed from a supply pipe, and it produces very uniform heating and temperature increment. The most important item in the construction of the oil furnace is to have a suitable jet for pulverizing the liquid fuel into so fine a spray that it ignites readily and keeps burning steadily and completely in the furnace. Many types of oil burners are now on the market, and no difficulty should be met with in procuring a convenient form. The flame of the burning oil spray should be directed tangentially to both the furnace wall and the crucible, so that it sweeps round the annular space before finding outlet through the furnace cover. Some forms of furnace can be purchased complete and ready for use, but many of these are somewhat expensive, and there is no reason why a suitable furnace should not be built very cheaply.

ELECTRIC FURNACES

The application of electrical energy for melting non-ferrous metals has not received adequate attention in this country, chiefly on account of the cost of power, and a rather strong conservatism among brass-founders. On the Continent, several forms of transformer furnace have been developed for melting gunmetal and brass, and in this type of furnace the carbon crucible acts as the resistor to the passage of the alternating current and thus generates the necessary heat. More promising is the American type of furnace, made by the Pittsburg Electric Furnace Co., Pittsburg, Pa., to the design of Mr. Wile. The furnace is a combination of the arc and resistance types, after the style of the Héroult Electric steel furnace, with this difference, that four carbon electrodes are used for distributing the heat as uniformly as possible. The melting is performed under a cover of glass which is introduced solid and first heated by the arcs being brought close together, and then being gradually moved apart, as the glass becomes a good conductor when fluid. The metal to be melted is next introduced, and sinks to the bottom, where the current has to pass through it as well as the molten glass, and the fluid covering completely protects it from oxidation. Either direct or alternating current may be used, and the furnace can be constructed as a fixed or as a tiltin mechanism. It is more conveniently made to tilt in order to pour out the required quantity of gunmetal. It is said that 200 lbs. of gunmetal can be melted in 30 minutes with a consumption of 20 kilowatts, and the furnace of 1,000 lbs. capacity can melt about one ton of metal per hour, using 70 kilowatts. This makes somewhat expensive melting, unless electric energy can be very cheaply procured, but the low melting loss, stated as from 0.3 to 0.4 per cent. partly compensates for this.

AIR FURNACES

Where large quantities of metal are required for heavy castings, and it is very difficult to collect small pot charges into a ladle and keep the metal warm enough for casting, it is more economical and speedy to use a convenient size of reverbatory or air furnace, which produces metal of completely homogeneous composition. This form of furnace may be made in almost any size for holding upwards of two tons of metal, and it should be constructed with a large fireplace to contain the necessary fuel, which may be coal of the long-flame variety. The hearth should be steeply inclined away from the firebridge and towards the side of the furnace where the tap hole is situated. The greater part of the charge may be stacked on the furnace hearth before lighting up, and care should be taken to admit as little excess of air as possible. The steep arch in the roof, as shown in Fig. 3, is useful in deflecting the flame on to the melt. One important point to watch when melting in the reverberatory furnace is that the gunmetal is covered as much as possible with a good layer of charcoal to protect the alloy from excessive loss by oxidation, and also to keep any impurities in the products of combustion, such as sulphur

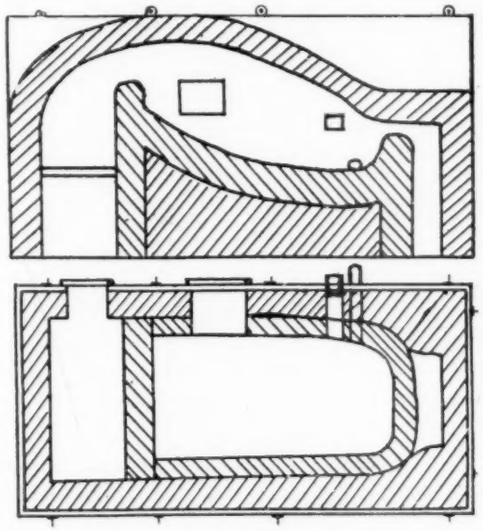


FIG. 3. FIVE-TON AIR FURNACE FOR GUN METAL.

from the fuel, from becoming absorbed in the metal. The escaping gases pass into the flues at a high temperature, and thus the melting efficiency is not great, but by drawing off the gases downwards instead of directly upwards into the stack, a considerable saving may be effected. Sometimes it is possible to make use of the hot gases for drying purposes by passing them through suitable underground flues, but care must be taken not to obstruct the flow of the gases too much.

Tappings of metal may be taken from time to time and fresh additions of ingots made to keep up the charge to whatever quantity is required, but where possible the mixing should be completed and through rabbling resorted to before making any removal of metal for casting, as otherwise there is a considerable chance of the alloy not being strictly uniform. The ladles of molten metal should be carefully skimmed and covered with a layer of charcoal, awaiting their contents falling at the proper casting temperature. When not in commission for making large melts for heavy castings, the air furnace may be very profitably utilized in melting down scrap metal of questionable quality and casting it into ingots of suitable size which may be analyzed and made up to first quality by the requisite additions of ingot metal during remelting.

(To be continued).

STANDARDIZING MOLDING SANDS.

The size of the casting as well as the kind of metal used in the casting must be considered in selecting a molding sand, in the opinion of C. Powell Karr, associate physicist, U. S. Bureau of Standards, Washington. In "A Preliminary Report on Molding Sands" presented at the last annual meeting of the American Institute of Metals, he characterized the proper sands for different metals as follows:

Sands for steel casting should contain 97 per cent. or more of silica, with a small amount of clay for bonding purposes.

Sands for iron casting should be loamy, and their texture varies with the size of the casting.

Sands for bronze should be of fine grain, good bonding power and should have a high degree of permeability—a rather difficult combination.

Sands for brass and aluminum should be fine grained and loamy, similar to those used in molding stove plate, and they should also possess a good degree of permeability.

The permeability, he said, may be expressed by the time of flow of 100 cc. of water through 100 cc. of sand in a vessel of the specified dimensions. This time may be 2 min. plus or minus 5 sec., in a sand of good permeability. Such a sand, other conditions being equal, would be adapted to almost all grades of bronze and ordinary brass. For German silver a greater degree of permeability would be almost necessary.

The durability or life of a sand is a matter of great economic importance. Very little of practical value has been done on the study of this subject. The Bureau of Standards, he explained, intends to conduct a series of researches on the life of various molding sands by actual molding tests, conducted with various metals and poured at different temperatures.

It has been suggested by various investigators that a good molding sand could be artificially prepared by crushing fine quartz, or obtaining fine quartz sand and adding a sufficient amount of clay and other bonding elements to give it the proper degree of cohesiveness; but the difficulties in the way of coating each grain of quartz with a film of clay of uniform thickness, Mr. Karr notes, would seem to make the problem almost insurmountable; and yet, as natural molding sands become exhausted, its production may some day be of great economical importance.

HIGH GLOSS LACQUER.

A good formula for a high gloss lacquer is as follows:

White French varnish (cut in denatured alcohol)	3 quarts
Amyl acetate collodion (8 ounces per gallon)	1 quart

This mixture will give you the body lacquer and the thinner should be composed of the following:

Fusel oil	½ gallon
Amyl acetate	½ "

One part of the mixed varnish and collodion and one part of the mixed thinner gives excellent results for brush purposes, but for spraying two parts of the thinner may be used. The varnish alone gives excellent results, but three parts of the thinner will be required.—C. H. P.

ELECTRO-PLATING ENGINEERING

A Series of Articles Relating to the Operations and Equipment Employed in Electro-Plating and the Reasons Therefor.

Written for The Metal Industry By C. B. Willmore, Electro-chemist.

(Continued from March.)

STEEL TANKS.

The suitability of any material for holding chemical solutions will depend largely upon its chemical and physical properties, and in choosing such a material one must necessarily inquire into these chemical and physical properties. For such purposes iron and steel have been found to possess many desirable qualifications. Chemically, iron has the following characteristics: It is attacked quite readily by dilute sulphuric, hydrochloric, or nitric acids; but it is acted upon by concentrated acids only very slowly. This latter property is most noticeable in the case of sulphuric acid, and because of it steel or cast iron vessels make good containers for concentrated sulphuric acid. In fact large shipments of commercial oil of vitriol are usually made in steel tank cars, or at least in steel drums. The non-corrosion of iron in concentrated sulphuric acid is not due to the fact that the iron is not attacked by the concentrated acid, but to the fact that iron sulphate is insoluble in the concentrated acid, and the thin film of iron sulphate that is first formed when the acid comes in contact with the metal cannot be dissolved away to expose new metal, consequently it serves as a protective coating towards the iron beneath it. If the acid contains 30 per cent or more of water, then the iron sulphate film will gradually be dissolved away as it is formed, and will expose more metal beneath to be attacked by the acid. Impurities in the iron or steel often play a very important part in its corrosion. The amount of these impurities present is not so important as the manner in which they are distributed throughout the metal. If the impurities tend to form combinations with the iron, and thus to make its structure heterogeneous, then corrosion will be enhanced. If the impurity merely mingles with the iron to form a perfectly homogeneous solid solution, then it is quite possible that it will serve to mitigate the corrosion. As an example of this, it is thought by many authorities that the addition of small amounts of copper will decrease the corrosion of steel. As a general proposition, however, the effects of impurities are harmful and the purer the steel the more resistant will it be to corrosion. In this connection, it is interesting to note that there is a grade of iron on the market, known as American Ingot Iron, and containing only about .05 per cent of impurities, which is claimed to be very highly resistant to corrosion. So far as I am able to ascertain, no electroplating tanks are being made of this metal at present; but it would seem to be an ideal material for the purpose, and the future may see some such use being made of it.

In the case of nitric acid, a different effect is observed. If a piece of iron be dipped into concentrated nitric acid for a short time, it is found that it will not subsequently be attackable by dilute acids. This condition of the iron is known as "passivity." Its exact cause has not been conclusively established; but there is good reason to believe that it is due to the formation upon the surface of the iron of a film of magnetic oxide of iron (Fe_3O_4), which is itself resistant to acids and consequently protects the metal beneath it. This protection, however, wears off in time, so that it is not commercially of very much importance. It may be of interest to the reader to know that this film of magnetic oxide of iron may also be produced by making the iron piece the anode in a weak solution of an acid; oxygen is evolved at the anode by the passage of the current, and this then combines with the iron to form the Fe_3O_4.

Alkalies, either molten or in solution, do not attack iron; in fact, they serve as a protection against rusting of the iron. Neutral salts may or may not attack the iron, according to their degree of dissociation in solution, and to the relation between the single potential of iron and that of the metal in solution. A metal of higher single potential will replace a metal of lower potential in a solution of its salt. This rule is one that is well known to every electro-plater and its truth has been established beyond the shadow of a doubt. It is clear, then, that if iron be placed in a solution of the salt of a metal having a lower single potential than the iron, that the iron will be corroded by the salt, the metal of lower potential being thrown out of solution, and the iron taking its place. If the metal thrown out of solution were to form a perfectly adherent and impervious coating over the surface of the iron, it would then prevent further contact of the solution with the iron and would thus preserve the iron from further corrosion. This, however, is never the case, for as the metal is being deposited on the iron, the surface of the iron is being eaten away so that there is no chance for the deposited metal to adhere closely, consequently it falls off, leaving the surface of the iron free to undergo more corrosion. As an example, the single potential of copper in sulphate solutions is about six-tenths of a volt below that of iron, so that a solution of copper sulphate will attack iron quite readily. The first thin coating of copper may adhere fairly well, because corrosion has not yet proceeded very far; but soon more of the solution gets through this thin deposit, attacks the iron beneath it and thus loosens up the deposit so that it easily falls off.

In the case of nickel sulphate solutions, nickel has a potential of about one-tenth of a volt below that of iron, so that the corrosive action of nickel sulphate on iron is not nearly so rapid as that of copper sulphate. Yet there is nevertheless a certain amount of corrosion which will in time injure both the tank and the solution, so that it is inadvisable to keep nickel sulphate solutions in steel tanks.

Zinc is above iron in potential in all acid solutions, so that a strictly neutral zinc sulphate solution might be kept in an iron container; but if the bath became slightly acid, then the excess of acid would surely attack the iron and contaminate the solution.

Chlorides, nitrates, and acetates are seldom, if ever, used for electroplating solutions; but in case one ever wishes a container for such salts, he should bear in mind that the single potentials of all of the more important metals except zinc are below that of iron in solutions of chlorides, nitrates, and acetates, and it is therefore unwise to keep such salts in iron or steel containers.

In cyanide solutions, on the other hand, it is found that iron is below all of the other important metals, so that it is not corroded by metallic cyanides, nor does it contaminate cyanide solutions. Iron and steel tanks are therefore quite satisfactory for use with cyanide solutions.

Physically, steel is one of the strongest materials we have. It is stiff enough so that it can be used alone with-

out any need of bracing, and is elastic enough and tough enough so that it will stand a great deal of shock and bending with fracture. Cast iron, on the other hand, is much more brittle, and although it has greater crushing strength, its tensile strength is so low as to unfit it for use where rough treatment is anticipated. Both materials may be heated to the boiling point of water without warping out of shape as lead does. On the other hand, both are good conductors of electricity, so that it is quite important to have the tank rods well insulated.

From the above list of chemical and physical characteristics it will be apparent that steel and iron tanks are quite suitable for use with cyanide solutions; but not for other plating solutions. They are somewhat more expensive, as a rule, than are wooden tanks, so that in the case of cold cyanide solutions, the pitch-lined wooden tanks are usually preferred. But in the case of hot cyanide solutions, they are found to be more satisfactory than any other kind of tank, and it is in this field that they find the most extensive use.

CONSTRUCTION OF IRON AND STEEL TANKS.

In construction, iron and steel tanks are quite simple. Where the tanks are fairly small, as in the case of potash kettles, and the tanks used for electric cleaners, they are usually cast. It is difficult, however, to make large castings of this type with thin walls, and even if it were easy to make them, cast iron would not be strong enough for the purpose, so that the larger sized tanks are usually made of heavy sheet steel from 3/16 in. to 5/16 in. thick, either welded or riveted together.

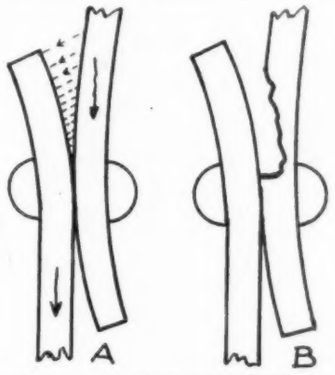


FIG. 9. SHOWING AN EXAGGERATED CASE OF INJURY TO A SEAM BY STRAY CURRENT ELECTROLYSIS.

Other things being equal, it is much to be preferred that the seams be welded rather than riveted. In a previous article, dealing in part with lead lined tanks, it was shown that even with the lead lining insulated from the tank rods, a certain portion of the electroplating current will be carried by the lead lining. In the same way, of course, a steel tank is bound to carry a portion of the current, and if the joints between the plates are riveted rather than welded, then the electrical resistance in the path of the stray current, will be higher at this point and the current will partially go around the joint through the solution. The result of this will be that where this portion of the current leaves the one plate to go to the next plate, there is certain to be a degree of corrosion, the magnitude of which depends upon the size of the stray current. Fig. 9-A shows this action in exaggerated form. The dotted lines in this figure represent the path of that portion of the stray current which goes from one plate to another through the solution. Fig. 9-B shows how the one plate which acts as the anode of this small system will be eaten away in time and quite effectively weakened at a very important place in the tank. If there were a perfect contact between the two plates, then none of the stray current would take this small by-path, no electrolysis would occur at this point, and there would consequently be no corrosion. If the riveting is very carefully done, and the edges of the plates are well caulked, the danger of corrosion is very slight. Double riveting is an added precaution in the right direction, as it not only makes firmer contact between the two plates, but makes the joint stiffer, and reduces the tendency for it to buckle under load, as shown in exaggerated form in Fig. 9, which single riveted joints sometimes possess. Any method that can be used to secure good contact between the two plates, and to prevent a gap between them, however slight, into which the solution might penetrate, will certainly prolong the life of the tank. If the two plates are electrically welded together instead of being riveted, the effect is the same as if the tank were all one piece, and there are no joints to become corroded. With hot solutions, the tank is put under greater strains than with cold solutions, and there is an accompanying greater tendency towards buckling at the joints, so that the advantages of welded over riveted tanks become more apparent when using hot solutions.

From the above discussion it is not to be concluded that every riveted tank is a weak affair which is likely to become leaky after a few weeks of service. If the joints were poorly made, the amount of stray current large, and if the solution in use were one in which the iron would be dissolved by electrolysis, this might occur. Fortunately, however, most iron tanks are used only for cyanide or caustic solutions, and in this case, where the iron is made the anode, it does not dissolve in the solution, but merely becomes oxidized by the oxygen evolved upon it during electrolysis of the solution. This oxide adheres rather firmly to the iron beneath it and helps to cut down further corrosion, thus prolonging the life of the tank. Even under bad conditions of service, it may take several years for the joints to be eaten through; and there are any number of riveted tanks in use where the joints are so carefully made that they show no signs of corrosion even after many years of service. On the other hand, however, if a plater has his choice of two tanks of equal price and equal quality of workmanship and material, one riveted and the other welded, he would certainly make a mistake if he chose the riveted tank. The chances are that the riveted tank will stand up all right, provided it is well made; but there is also the chance that it may not. On the other hand, there is no chance for the welded joints to corrode through, if the welding is properly done, so that the welded tank certainly has a great advantage over the riveted one. In fact, most platers would be willing to pay more for this extra guarantee of good service. In this connection, it is quite significant that most dealers in electroplaters' supplies will not guarantee their riveted tanks against leakage.

A flange is usually placed around the top edge of the tank. This is not absolutely necessary, but it improves the appearance of the tank, strengthens it somewhat, and removes the sharpness of the thin edge of the tank, which would be quite likely to scratch the arms of the workmen now and then as they remove the work from the tank. With any workman, a scratch is a dangerous thing, as most of them will not take the time from their work to keep the wound clean and thus they run the risk of becoming infected. The workman in the plating room not only has this risk, but also the more dangerous one of absorbing poisonous chemicals, particularly cyanide, through such open places in his skin. It is just as well, therefore, to remove as far as possible the danger of an occasional scratch or cut.

(To be continued.)

PEPTONE AS AN ADDITION AGENT IN STANNOUS AMMONIUM OXALATE BATHS*

A Report of Experiments Made to Produce a Firm Smooth Coat of Deposited Metal.

By Frank C. Mathers and Barrett W. Cockrum.†

The statement was made in the previous paper[1] that the best tin deposit was obtained from a stannous ammonium oxalate bath containing peptone as an addition agent, the use of which was discovered in this laboratory. Without the peptone the deposit is of no value as a protecting coat, because it consists of projecting needle-like crystals.

The effect of the peptone (Witte's) was remarkable. As soon as it was added, the tendency to form the projecting, loosely adhering crystals ceased and the deposit became so smooth and finely crystalline that thick cathodes (0.5 to 1 cm. thick) could be prepared, and so firm and coherent that shavings of tin could be cut from the deposit with a knife.

Clove oil, glue, gelatine and formin, agents which have been found effective with other metals, were practically without any beneficial influence in preventing the formation of the crystals. Licorice extract and aloes residue[2] prevented the formation of loose crystals but peculiar club-like projections formed on the cathodes.

Carbon disulphide, even in small amounts, made the deposit spongy and non-adherent, a condition which persisted until the carbon disulphide was exhausted, when the deposit again became crystalline. There was no intermediate time when a non-crystalline, solid deposit was obtained. The carbon disulphide was different from the other addition agents, none of which produced a spongy deposit.

MANIPULATION.

The experiments were conducted as described in the previous paper[1]. The active area of the anodes was 32 sq. cm. and of the cathode 50 sq. cm. The volume of the bath was 300 cc. A current density of 0.4 amp. per sq. dec. (3.6 amp. per sq. ft.) was used. The anodes were amalgamated, to keep the anode slime out of the bath. The baths were stirred occasionally. Impurities in the anodes sometimes caused the formation of an insoluble coating which had to be removed mechanically.

CONCENTRATION OF THE BATHS.

The addition of 0.1 to 0.5 per cent peptone to the bath containing 2.5 per cent stannous chloride, 5.5 per cent ammonium oxalate and 0.3 per cent oxalic acid (the composition generally recommended) gave a smooth, firm deposit on the bottom of the cathode but the top part was dark, clearly showing that the bath did not contain enough tin. Solutions materially more concentrated than the above formed crystals of a salt in the bath, a trouble which was greatly lessened by starting with stannous oxalate in place of the stannous chloride, whereby the ammonium chloride was eliminated.

The result of numerous experiments showed that a very satisfactory concentration and composition was 5 per cent stannous oxalate, 6 per cent ammonium oxalate, 1.5 per cent oxalic acid and 0.25 per cent peptone, as compared with 2.28 per cent stannous oxalate, 4.14 per cent ammonium oxalate and 0.3 per cent oxalic acid for the original bath.[3] The principal advantage in using the increased amount of oxalic acid is that it prevents the "crawling" of the solution up the sides of the beaker, owing to the capillary action of porous crystalline salts. Larger amounts of oxalic acid, 7 to 10 per cent, caused the formation of hard crystals of a stannous salt upon the electrodes. Acetic acid may be used in place of the oxalic, but it showed no advantage. A higher concentration, 7.5 per cent stannous oxalate and 9 per cent ammonium oxalate, caused more trouble from "crawling" and from the formation of crystals of salt. More ammonium oxalate than is required to dissolve the stannous oxalate and to keep the anodes clean is not desirable, because it greatly promotes the formation of salt crystals in the bath. Variation in the quantity of peptone was without much effect, but 0.1 per cent gave a rougher deposit than 0.25 per cent, the quantity which is recommended.

MAINTENANCE OF THE BATH.

Continuous electrolysis of the bath produces a decrease in the concentration of tin, free oxalic acid and peptone. This decrease in the concentration of tin shows itself after a time by the darkening of the deposit, which finally becomes black and non-adherent and, at last, gas is evolved from the cathode. The addition of stannous oxalate immediately causes the deposit to become bright and coherent again, thus clearly showing that the trouble was caused by lack of tin.

The anodes, if they have become covered with a coating of insoluble material, must be washed with a brush until the pure tin is again exposed, and more ammonium oxalate should be added to the bath.

During electrolysis, a fine yellow precipitate forms in the bath and settles to the bottom as long as sufficient oxalic acid is present, but if the bath needs more oxalic acid, porous crystalline salts form on the sides of the beaker and on the electrode connections at the surface of the liquid, and gradually climb upward. The addition of more oxalic acid stops this.

More peptone must be added whenever the deposit shows projecting crystals.

Baths run at 50° C. (122° F.) required more doctoring than those at room temperature and the crystalline structure of the deposits was more pronounced.

In spite of these additions to the baths, they finally became so deteriorated that bright solid deposits could no longer be obtained.

CURRENT DENSITY.

A good deposit was obtained at 0.8 amp. per sq. dec. (7.4 amp. per sq. ft.). However, the experiments described in this paper were run at half that density. The voltage averaged about 0.5 with the cathode midway between the two anodes, which were 4 cm. apart.

OTHER SALTS IN THE BATHS.

Potassium stannous oxalate is less soluble than ammonium stannous oxalate, hence potassium oxalate cannot be used in place of the ammonium oxalate. Potassium and ammonium chlorides were not desirable additions, on account of their tendency to form crystalline salts.

CHARACTER OF THE DEPOSITS.

Some of the cathodes, when heated just a little above the melting point of tin, swelled and foamed, and the vapor which was given off burned, thus showing the

*A paper presented at the Twenty-ninth General Meeting of the American Electrochemical Society held in Washington, D. C., April 27-29, 1916.

†Indiana University, Bloomington, Ind.

[1] Mathers and Cockrum: Tests of Tin-plating Baths. Trans. Am. Electrochemical Soc., 29, —— (1916).

[2] Trans. Am. Electrochem. Soc., 27, 131 (1915).

[3] Bath 1 of Kern's Report. Trans. Am. Electrochemical Soc., 23, 199 (1913).

occlusion of considerable amounts of organic material. A porous, foam-like mass of metal remained if the heating was discontinued at the proper time.

CONCLUSIONS.

The addition of peptone to the stannous ammonium oxalate bath is essential for the production of a thick, smooth, finely crystalline deposit of tin. No other tin bath (except possibly the sulphide, which was not tried) is known from which such a thick, smooth deposit can be obtained.

A good composition of bath is: 5 per cent stannous oxalate, 6 per cent ammonium oxalate, 1.5 per cent oxalic acid and 0.25 per cent peptone. The stannous oxalate may be easily made by precipitating a solution of stannous chloride with oxalic acid.

The bath was run at room temperature at 0.4 amp. per sq. dec. (3.6 per sq. ft.). The solution must be stirred at intervals.

The authors wish to thank the American Electrochemical Society and its Committee on Assisted Research for the grant of money for the purchase of a portion of the materials used in this research.

THE CASTING OF METALS IN CHILL MOLDS.*

THE EFFECTS ON THE MECHANICAL PROPERTIES OF COPPER ALLOYS USED FOR GOVERNMENT WORK BY POURING INTO IRON OR STEEL MOLDS.

BY J. JOHNSON, M.Sc.

On January 22 at a meeting of the Birmingham Branch of the British Foundrymen's Association, to which members of the Birmingham Local Section of the Institute of Metals, the Birmingham Metallurgical Society, and other local technical scientific societies had been invited, a lecture was given by Mr. F. Johnson, M. Sc. (Head of the Metallurgical Department of the Birmingham Municipal Technical School) on "The Casting of Non-Ferrous Alloys in Chill Molds."

Mr. Johnson in his introductory remarks, said that he thought no apology for the chill casting was needed. Under certain conditions the chill-casting could be rapidly produced if simple in shape or in the form of bar. The speed of production, however, could not compare with that of the sand-casting, and it was only in the case where the superior mechanical properties of the chill-casting were indispensable, that it came up for consideration.

ADVANTAGES AND DISADVANTAGES.

Putting the matter briefly, the following were the advantages and disadvantages of the chill-castings. Chief advantages.—(1) Better mechanical properties. (Not so much due to chilling action as to absence of pores.) (2) Sand-moulding labor dispensed with. (3) Ease of extraction and re-preparation of mold. (4) Suitably for repetition work. (5) Saving of scrap and swarf as against bar metal. Disadvantages.—(1) Reduction of output unless organized for repetition work. (2) Inferiority of surface unless conditions are ideal. Necessitates more machining. (3) Difficulty of "coring" intricate parts. (4) Initial cost of mold and slow deterioration in use. The great advantage of chill-castings, over sand-castings which strongly appealed to him was the marked superiority in mechanical properties possessed by the former. The common belief that the superiority was due to the "chilling" action of the mold producing rapidity of solidification and cooling required considerable modification.

Unlike iron-carbon alloys, the brasses and bronzes did not possess an intensely hard constituent which was retained by rapid cooling. In the case of brass containing the Beta phase, relatively more of this strong constituent was probably retained by the rapid cooling of a chill-casting than by the slow cooling of a sand-casting. The improvement in mechanical properties due to this fact couldn't be regarded as important. In the case of copper-tin alloys, relatively more of the Delta phase would be retained in a chill-casting. There was, however, another consideration involved in rapidity of solidification and that was introduced by the presence of gases in the molten metal. As was well known, such gases were less soluble, the lower the temperature, and if thrown out of solution immediately prior to solidification, they were trapped in the casting in the form of small bubbles. The more rapid the rate of solidification the less gas would be thrown out of solution, or, even if all were thrown out, would be trapped in the form of very minute bubbles. A slow rate of solidification, as in the case of the sand-casting, allowed of coalescence of gas bubbles, formation of larger cavities and consequently greater weakness.

A third and most important reason for the comparative weakness of sand-castings lies in the porosity of the metal due to cavities formed by minute bubbles of air and steam.

It would appear, therefore, that the superiority of the chill-casting is due more to soundness than to any marked difference in constitution. The chill-casting did, however, exhibit a closer grain, the crystals being much smaller than the crystals in a sand-casting of similar composition.

MATERIAL AND DESIGN OF CHILL MOLD.

Coming to the question of the best form of chill mold, Mr. Johnson said: The three materials which suggest themselves as suitable for chill molds are: grey cast iron, steel and malleable cast iron.

The author has used the two former and found them satisfactory. Cast-iron molds are more easily produced and should be made with a generous allowance for machining to the exact dimensions required for the production of a casting which itself must be on the large side to allow for the removal of surface defects by machining. The thickness of the walls of the mold depends upon its size. For small castings the walls need not be more than 2 in. thick. Thin molds are more liable to fracture when roughly handled; the thicker the mold the quicker the abstraction of heat from the casting.

Steel molds may be thinner, and it is possible, in the case of single small molds, to clamp together the split halves of a piece of round bar steel and machine out the internal shape of the mold in the lathe.

Whether the parts of the molds form vertical or horizontal joints, strong clamps should be provided of a simple type which lends itself to rapid tightening and loosening. A form of clamp favored by the author acts on the same principle as the ordinary foundry crucible tongs, the tightening being effected by forcing a small steel link over the handles.

For round molds a simple ring of wrought iron with the free ends drilled to take a small bolt and butterfly nut is effective.

A cast ring, drilled and tapped to take a small eye-bolt is also satisfactory and simply handled.

For square and rectangular molds a rectangular ring fastened with eye-bolt or wedges may be used. The disadvantage of using loose wedges lies in the inconvenience arising if they are not to hand when wanted.

If the parts of the mold are hinged together, the hinges should work smoothly and easily.

Dowell-pins may be used to obtain correction of alignment of the parts and may serve also to hold them together when passed straight through the corresponding holes and held tightly by nuts or keys.

The mold parts should be fitted with suitable handles to facilitate handling when removing the casting; these may either be cast or screwed in.

Strict attention should be paid to the venting of the joints so that there may be free egress for air from the mold. If there is insufficent provision for escape of air, the casting will be either spongy or its surface spoilt by the presence of air-pockets.

By cutting thin, shallow grooves across the surfaces of the joints, these troubles may be obviated.

One method of venting chill molds was described by H. G. Barrett in illustration of his remarks at a London branch meeting of the British Foundrymen's Association, April 23, 1915.

The composition of the iron for cast-iron molds is a matter of considerable importance. The iron should be tough and close-grained, and, it is needless to add, free from blowholes. Strength and toughness are very important, as the molds have to withstand rough handling. W. J. May† gives some useful information on the "Making of permanent Iron Molds for Castings," and recommends the production of molds with such a good finish that machining will be unnecessary.

He instances the following composition of an iron successfully used for molds:

Combined carbon	.84 %
Graphitic carbon	2.76 %
Silicon	2.02 %
Sulphur	.07 %
Phosphorus	.89 %
Manganese	.29 %

The high phosphorus content is justified by May on the ground that the fluidity which it confers enables molds of sharper outlines to be produced. He also states that an iron high in combined carbon would probably "grow" and become deformed under repeated heating.

The author considers that from the point of view of the user a high phosphoric content is inadmissible. The phosphide eutectic has a very low fusing point, and the repeated contact of molten copper alloys has an erosive effect which rapidly spoils the surface of the mold. Cast-iron molds containing phosphorus and used for the casting of copper cylinders have, in the author's experience, rapidly deteriorated and caused much trouble in the extraction of the castings owing to the badly eroded surfaces causing "sticking." The presence of phosphorus, moreover, increases brittleness and thus impairs the resistance of the mold to the effects of rough handling. A cast-iron with low phosphorus content is, therefore, a desideratum, for even if sharp outlines are not obtained the surface can be machined and, thus prepared, allows of the production of castings, cleaner and truer to size. It must also be remembered that not every iron-molder can produce castings with highly-finished surfaces.

† "Mechanical World," Vol. 58, Aug. 20, 1915, p. 91, Sep. 3, 1915, p. 114.

COATINGS FOR MOLD SURFACES.

For the protection of the mold surface and to facilitate the extraction of the casting, a dressing should be applied to the mold. The author has tried numerous dressings, such as sea oil, lard oil, linseed oil, Russian tallow, etc., mixed with charcoal or plumbago. Sea oil, liberally charged with fine plumbago appears to be as satisfactory as anything. It should be warmed and liberally applied, well rubbed on to the mold surface, and all excess removed before pouring. Considerably more disadvantage than advantage will accrue from leaving an excess of the oily dressing in the mold.

In contact with the molten metal, some distillation takes place with the production of gaseous hydrocarbons which are trapped in the casting before they can gain egress from the mold. Just sufficient dressing is required to form a gaseous envelope between the casting and the mold in order to give a clean surface to the former, to facilitate its extraction and to protect the surface of the mold.

If carbonaceous dressings are considered undesirable, an emulsion of bone ash and water applied with a brush to the warm surface of the mold should prove efficacious. The water is rapidly evaporated by the heat of the mold.

A very uniform and satisfactory dressing may be applied by holding the mold-surfaces over a smoky flame, that from burning resin being very effective, if troublesome.

The warming of the mold prior to pouring is indeed important, owing to the "blowing" action of rust or moisture.

STEEL V. SAND FOR CORES.

The composition and arrangement of cores presents some difficulty. After using sand cores the author resorted to the use of tapered steel cores and found them more satisfactory. The careful alignment of sand cores in iron molds presents difficulties, whereas steel cores may be much more accurately fitted; they are permanent, thus effecting economy in labor, may be easily removed and leave a cleaner, smoother surface on the casting. They should be "dressed" similarly to the mold.

The London Branch Secretary of the British Foundrymen's Association in a short paper on "Casting Brass in Chill Molds" read April 23, 1915, recommends the use of dry-sand cores of a "light hard nature which disintegrate under the heat and pressure of the metal immediately after solidification." The disintegration of the core depended upon the nature of the binder used with silica sand. Those binders which left an open structure after drying, promoted disintegration. Linseed oil is used successfully as a binder.

METHODS OF GATING.

The provision of a satisfactory "gate" for chill molds has introduced difficulties. Owing to the rapid chilling effect of iron, no marked constriction of space at the junction of the head with the casting can be allowed, as setting of the metal is likely to take place here before the casting has solidified. The solid neck thus formed prevents the remaining molten metal in the head from fulfilling its true function, viz., that of feeding the spaces in the casting caused by shrinkage. By carefully diminishing the rate of pouring as the mold fills, this difficulty may be partly overcome, but with even this precaution, a considerable amount

of metal is required for the head when formed in the mold itself. It occurred to the author that a very much smaller head would suffice if it could be kept molten until after the solidification of the casting. To effect this the gate was made in sand and in a detachable ring placed on top of the mold and kept firmly in position while pouring. The lower thermal conductivity of the sand enabled a very small head to do all the feeding. A small riser was also added with the object of securing free egress of gas and air from the mold. (See Fig. 1).

The small heads shown proved that the feeding was satisfactory. In one experiment the weight of the head represented only 8 per cent. of the total weight of metal used.

This method also has the advantage of securing a more effective elimination of dross, air and gas. Particles of dross on the surface of the rising metal in the mold are held in the solid skin, which forms immediately the metal touches the iron "roof" of the mold. When this roof is of sand, the abstraction of heat is less rapid, and opportunity is thus afforded for the particles of dross to be carried upward into the head. Gas and air also find outlet through the interstices in the sand.

SURFACE CONDITION OF CASTING.

The elimination of dross from the surfaces of the casting has proved to be the greatest difficulty which has confronted the author in producing brass castings in chill molds. Various devices have been adopted to overcome this difficulty.

The position of the mold has some bearing upon the

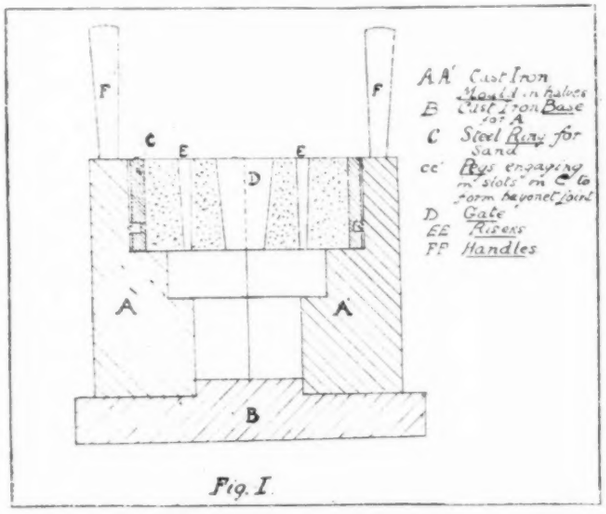


FIG. 1. A MOLD MADE WITH SMALL HEAD AND RISER.

problem. Taking, for instance, an article of cylindrical shape; if placed with its main axis in a vertical position, the ascending dross will have to change its direction from vertical to horizontal when the top of the mold is reached, and the chances of its complete elimination are small.

On the other hand, if placed in a position with the main axis at an angle of 45 degrees from the vertical the horizontal surface of the molten metal will never strike a horizontal surface of the mold, and particles of dross will never have to choose the only alternative to imprisonment in the mold, namely, that of traversing a horizontal path towards the outlet. Similarly, a mold should be so made that any projecting portion of the casting is at the top and not at the bottom, in which latter case the overhanging portions of the mold encourage the imprisonment of dross. (See Fig. 2).

The best possible way to secure castings with smooth, clean surfaces is to prevent ingress of all dross and oxide to the mold.

A suitable flux which will dissolve zinc oxide is very useful, but zinc oxide is produced even in the stream of molten metal entering the mold, as also is aluminium oxide if aluminium be present.

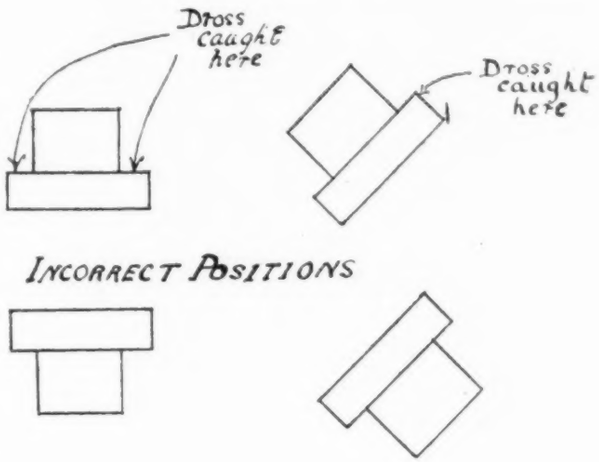


FIG. 2. UPPER—INCORRECT POSITIONS OF MOLD. LOWER—CORRECT POSITIONS OF MOLD.

The addition of aluminium to copper-zinc alloys has the effect of checking the oxidation of the zinc by reason of the formation of a tough, tenacious film of aluminium oxide on the surface of the molten metal. This film protects the underlying metal from oxidation and incidentally enables a clearer view of the contents of the crucible to be obtained, the formation of obscuring fumes of zinc oxide being effectively obviated.

Neither flux nor deoxidizer, however, will secure a clean stream of metal, in practice, free from all dross, nor will the most careful skimming.

In order to prove that dross was the cause of rough surfaces, the author made the following experiment: A graphite crucible was pierced at the bottom with a ¼-in. hole and a ½-inch. arc lamp carbon was used to plug up the hole and act as a stopper. This crucible was heated to a red heat and placed in position over the gate of the mold.

Molten metal was poured into the hot crucible and, when it was reasonably certain that all the dross had risen to the surface, the stopper was removed and the clean metal from the bottom allowed to teem into the mold. The author was able by this means to produce castings quite free from surface imperfections. For a number of experiments it was found desirable to have the stopper in a controllable clamp.

The position of the casting is the reverse of that shown in Fig. 1 as, in "bottom-running" the dross and air are more perfectly eliminated and the position of the casting can have no material influence upon the cleanness of surface, especially if means are provided for trapping dross in the runner.

(To be continued.)

EDITORIAL

OLD SERIES
Vol. 22. No. 6

NEW YORK, JUNE, 1916.

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THE METAL INDUSTRY

With Which Are Incorporated
THE ALUMINUM WORLD, THE BRASS FOUNDER AND FINISHER, THE ELECTRO-PLATERS' REVIEW, COPPER AND BRASS.
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CONTENTS

ALUMINUM SOLDER

As the ancient alchemist vainly sought to produce a precious metal from a mixture of base metals so has the modern metallurgist sought to discover a solder for the metal aluminum. Two great obstacles have always prevented the realization of the metallurgist's hopes for the production of a perfect solder; the ready oxidation of aluminum and the ease with which it lends itself to electrolysis. When Professor J. W. Richards of Lehigh University published his book on aluminum in 1896 he recommended for a solder of aluminum a mixture composed as follows: One part aluminum, one part phosphor tin, eleven parts zinc and twenty-nine parts tin. This solder to the best of our knowledge has stood the test of time and is still in use, but even this is not infallible for we find some of our largest workers in the metal resorting to welding.

The Scientific American in its issue of May 13 had the following to say upon the subject:

SOLDERING OF ALUMINUM AS A SUBSTITUTE FOR WELDING.

Because of the impossibility of soldering aluminum satisfactorily in the past, this metal has not been used to the extent that its high utility otherwise justifies. Workers in aluminum have heretofore been obliged either to weld aluminum pieces together or to resort to a more or less satisfactory soldered joint, the latter difficulty being due to the impossibility of keeping the metal free from oxidization.

There has recently been introduced a new form of aluminum solder for which the claim is made that it will not only join two pieces of the metal together every time, but it will also make a joint that will be stronger than the aluminum parts. The new solder will do a better, quicker, neater, stronger, less expensive and more lasting job than by the welding process, it is claimed.

The new aluminum solder is said to be the only solder that runs at a very low temperature, and when cold is not only harder than aluminum but has more than twice the strength. A simple experiment that shows how much stronger the soldered portion is than aluminum itself is to solder two pieces of sheet or cast aluminum at right angles to each other. When the soldering is complete, an attempt is made to break the two pieces apart. Invariably the aluminum pieces will break before the soldered portion.

The simplicity of soldering with the new aluminum solder is another point in its favor. All that is required is a gasoline torch. The job to be done is heated; then, with slight rubbing with a hack-saw blade or a piece of iron, the metal and solder will combine without a flux of any kind.

Now let us see just how much of the above is really new. THE METAL INDUSTRY obtained the name of the manufacturers of the solder mentioned in the article and found that the material had already been described in THE METAL INDUSTRY for February, 1915, under one name and in January, 1916, there appeared a description of a compound which has all the earmarks of being the same material. So much for the "newness" of the dis-

covery. THE METAL INDUSTRY then took the matter up with two of the largest workers in aluminum and asked them for their opinions as to the best way of joining aluminum. Witness their answers:

1. Referring to your letter of the 18th regarding best method of joining aluminum, wish to advise that we have found welding superior to soldering. A soldered joint is usually not satisfactory if in contact with a liquid. Richards Aluminum Solder we have found satisfactory to use where we deemed a soldered joint advisable.

2. We have your favor of May 18. We have not given the soldering of aluminum a thorough trial, but the experience we have had with it has not been very satisfactory.

Welding seems to be the only satisfactory process, and that depends more upon the experience of the welder than it does upon the flame used. Either the oxy-acetylene or the oxy-hydrogen flame may be used. It will depend a little upon the experience of the operator which he prefers.

So it will appear that there is nothing new under the sun and until some method is found whereby the oxidizing tendency of the metal and its ready yielding to electrolysis may be overcome we believe that welding will be found to be the most satisfactory method of joining to suit all conditions as nothing but aluminum is employed in the operation.

CORRESPONDENCE AND DISCUSSION

WE CORDIALLY INVITE CRITICISMS OF ARTICLES PUBLISHED IN THE METAL INDUSTRY.

STANDARDIZATION OF CHEMICALS

TO THE EDITOR OF THE METAL INDUSTRY:

There was launched at Dayton, Ohio, in June last at the annual convention of the American Electro-Platers' Society an idea. To Charles H. Proctor should go the thanks and appreciation of the entire plating industry and every manufacturer directly or remotely concerned with this branch of industry. His idea was original in that it is the first time that it has been so clearly expressed, and as it is based upon pure logic and the ultimate benefit of those intimately concerned, it should have the unqualified endorsement and united support of every manufacturer marketing plated goods, every manufacturer of plating materials and supplies and every plater. More than these, it should also interest everyone who abhors waste and who is not too blind to see and appreciate the manifold advantages of combined intelligence, conservation and efficiency. I rather dislike to use that last word—efficiency. Seems to me that it is worked overtime of late, and if carelessly handled, it is likely to lose some of its original force. But it was necessary here. For Mr. Proctor's idea was the complete standardization of all chemical products used in the plating room, the solutions used in producing the results and the exposure of any and all forms of petty graft and corruption wherever found. This last is "some job." But it can and surely ought to be accomplished.

No individual in or out of the trade can sustain any real, legitimate argument against this program. It concerns the very fundamentals of the industry. Think what this will do to advance the science, the business of the manufacturer of supplies and materials required in the plating process, and the uplift which such a result would give the entire trade.

Listen to what Mr. Proctor says:

"There was a time in the years gone past, and I might say to a more or less extent in the present, when the plater bunkoed his employer, if I may use such a term, by purchasing materials in endless variety that in many instances had no connection or distinct bearing whatever in regard to his product, that were purchased to create delusion, to create mystery and secrecy in the manipulation of his solution." A little further on Mr. Proctor again utters the truth: "He (the plater) is offered each day an ever-increasing line of what I may aptly term patent-medicine plating nostrums. He is offered cleaners galore that are essentially the same product, but are sold under fancy names at about three times the normal value; if they were sold under their common commercial names of cauterized soda ash, sodium hydrates and aluminum silicate. He is confronted with a never-ending line of plating salts, all having fancy names and sold at an excessive price when compared with the actual price and value of the prime factors, the metal and its reducing agent; he is offered substitutes for cyanide which, based upon their cyanogen content, cost at least two dollars a pound as compared with the twenty-cent price or less of cyanides under the proper name."

Mystery. Nostrums. Patent-medicines. All belong in the same class. Who is there who can support them openly? They have no place in our modern thought. They should not be tolerated by anyone who pays the bills, directly or indirectly. They make the bills larger. They shut out the light. They do enable a few to hold their jobs—at least the mystery does. And they bunco everyone except the man who lives by them—and he is a parasite. What should happen to a parasite anyway?

Mr. Proctor has pointed the way—it is now for everyone who has the remotest interest in plating to follow and to give what aid he can. Because Mr. Proctor has stated the case so succinctly and so much better than I can, I am going to quote him some more: "Gentlemen of the Supreme Society, this is a part of your future work—the elimination of nostrums and the standardizing of commercial chemical products in the plating industry. The manufacturer who pays the price, the honest plater who is deceived in the product he buys, will work with you to evolve the elimination of such costly products that detract from the purpose of economy. The American Electro-Platers' Society should create a bureau of commercial chemical standards and every chemical product used in connection with the plating industry should bear the stamped approval of the society. The plater should know absolutely what the product he purchases consists of; he should know the minimum percentage of the basis material or of its compound parts; every legitimate manufacturer of commercial chemical products used in plating will welcome such an innovation, because it will put all such manufacturers upon a strict legitimate basis and insure honest competition. The manufacturer of metal goods that plates his product will welcome every effort you may put forth to bring such desired results and be willing to assist financially in the most important problems." A little further on he says: "Another important work of the society is to bring about the emancipation of the platers' supply houses from paying tribute to the plater to use their products; to the plater who pays tribute at the expense of his employer, to use a certain product because the supply house was instrumental in obtaining him a position upon the promise to use only goods of their handling or manufacture. Unfortunately, this is carried out to an alarming extent. The nefarious practice should be stamped out and the culprits ostracized from the benefits of the society. The names of such individuals or dealers should be published so that the

penalty should fit the offense. This is organized graft pure and simple, and must be stamped out. No honest member of the society will permit such conditions to exist; although it may seem difficult, it must eventually get to the root of the evil to destroy the branches of the tree of organized graft in whatever form."

Pretty good, sensible reasoning, the whole of it. It is a tocsin cry of defense which Mr. Proctor sounds. He appeals to the best instincts of all of us. Honesty of purpose and honesty in our business dealings, is what he calls for. Why should not his plan be supported? It is logical and destined to come sooner or later. No better time than the present could be imagined. The plating business is firm and on an established basis of utility and necessity. It is time to clean house and remove the cobwebs of delusion, tradition, mystery and—graft.

His plan in its entirety contemplates the ultimate standardization of plating solutions. Why not? The old fogy who insists upon secrecy and mystery and his own particular brand of "dope" for his solutions will be the only one injured. He is reactionary in a sense anyway, and deserves his fate. Upon examination, in most cases, objection from this breed of "plater" will be found to consist largely of his fear of losing his job to some wiser head who does not rely upon his "secrets" or occult knowledge of the art, handed down from the time of Noah.

The Government maintains at Washington a Bureau of Standards, which is ready and willing at all times to cooperate with interested parties in any work looking toward the standardization of any product or industry. It is a comparatively easy matter to stir up enough interest to enlist the active aid and co-operation of this bureau to obtain the desired results. Let's all help. Write to the bureau, as Mr. Proctor suggests, emphasizing your belief in the importance of the work to be undertaken, or write to Mr. Proctor, who undoubtedly will be more than glad to assist in any plan that may be projected, having for its object the house-cleaning he has proposed.

There is still some "mystery" in the plating business, and until it is removed the business will not be as healthy as it deserves to be. Get together and let's remove the "myst" (mist) from this particular brand of mystery.

THOMAS BROWN.

Brooklyn, N. Y., May 24, 1916.

A PIONEER PLATER VINDICATED

TO THE EDITOR OF THE METAL INDUSTRY:

I had the opportunity recently to catch up on my files of THE METAL INDUSTRY and was greatly astonished to read the article in the February issue by Mr. Proctor. The article in question treated on the "Speeding up of electro-deposits," the deposit referred to being nickel. It seems but a short time since many of your readers "jumped on" me for daring to state that a commercial application had been found for nickel sulphate (single salts) in nickel plating and that its use would not only greatly hasten the deposition, but give much better results than those secured from the so-called "double salts."

My amazement increased when I read the Munning-Loeb advertisement of pure nickel anodes, an advertisement that urges the purchase of anodes of higher purity and practically pushes the old 90-92 anode out of the running. A few years ago I had the temerity to advocate the use of pure nickel anodes and was laughed to scorn for my revolutionary ideas.

It is gratifying to feel that my efforts have at last shown results and both plater and supplier have come to realize, in spite of themselves, that efficiency is just as possible in the plating industry as in any other. It affords greater satisfaction to know that the plating industry is at last breaking the bonds of superstition and rule of thumb practice and adopting the methods of the present age. The change has come sooner that I had expected and it is now more apparent than ever that the modern plater, with knowledge and strength to absorb and apply new theories, has an unlimited field and a great future before him.

PERCY S. BROWN.

NYACK, N. Y., May 15, 1916.

DEPOSITION OF LEAD

TO THE EDITOR OF THE METAL INDUSTRY:

In reply to Mr. Preston's letter in the February issue of THE METAL INDUSTRY, I would refer him to Dr. H. J. S. Sand's paper, published in the Transactions of the Chemical Society, 1907, Vol. 91, Part 1, pages 396-397, also to the same investigator's paper read before the Faraday Society, published in the Chemical News, Vol. 100, pages 269-270, there are also several other standard papers on the subject, I think I have read them all.

It is impossible to deposit lead on the cathode in a hot nitric solution, provided sufficient nitric acid is present, especially if a little copper is present. The great advantage of the rapid method is that one can use large currents and a hot solution. I know laboratories where 10 amperes are regularly used.

ERNEST A. LEWIS.

Birmingham, England, May 20, 1916.

NEW BOOKS

MECHANICAL TECHNOLOGY—1915.—By G. F. Charnock. Size, 6 by 8½ inches. 635 pages, including index. 503 illustrations. Bound in boards. Published by D. Van Nostrand Company. Price, $3.00. For sale by THE METAL INDUSTRY.

This work, which is most comprehensive in its scope, is divided into three parts, the first of which covers the production and properties of the chief materials of construction and to which are devoted twenty chapters. Part two treats of preparatory processes, those depending upon the property of fusibiliay; nine chapters are devoted to this division. Part three contains preparatory processes depending on the properties of malleability and ductility and to these eleven chapters are devoted.

The author of this interesting work states in his preface that the great advance which has been made during recent years as the result of the application of science to industry has served to emphasize the fact that all manufacturing operations are based upon either chemical or mechanical principles. Technology is only another name for applied science, and it has thus become necessary to distinguish between chemical and mechanical technology. Chemical technology has been recognized as a separate branch of applied science for many years past, and the term conveys a distinct meaning which is now well understood. Mechanical technology, on the other hand, has scarcely yet come to be regarded as worthy of treatment on scientific lines. Although there are many excellent treatises on the various scientific branches of the subject, they are for the most part too highly specialized for general use, being intended for the expert or craftsman. Hence it seemed desirable to bring together in one volume a connected and systematic account of the chief operations underlying mechanical trades and handicrafts.

STEEL AND ITS HEAT TREATMENT—1916. By D. K. Bullens. Size 6 by 9 inches. 432 pages, including index. 223 illustrations. Bound in cloth. Published by John Wiley and Sons. Price $3.75. For sale by THE METAL INDUSTRY.

This book has the merit of bringing together the theoretical and practical sides of the general subject of steel and its heat treatment in such a manner as to be readily understood by all interested. The work consists of seventeen chapters which are devoted to a "heat talk" rather than a "furnace talk"; of heat application rather than details of construction.

As every brass shop finds it necessary to use steel tools of all descriptions, we have no doubt but what this latest work on the heat treatment of steel will prove interesting and valuable to every metal worker. The subject matter of the book is treated in such a clear and simple manner that it is quite refreshing to find the usual dry subject of heat treatment handled so skillfully. We should advise those of our readers who are concerned in the manufacture of metal articles to study the book.

SHOP PROBLEMS

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE.

ASSOCIATE EDITORS: JESSE L. JONES, Metallurgical PETER W. BLAIR, Mechanical CHARLES H. PROCTOR, Plating-Chemical

ALLOYING

Q.—We are desirous of making a cheap brass alloy to stand much bending after casting. We use standard rod ends and turnings, and pour in green moulds. The castings have an average thickness of 5/16 round or oval. We add about 8 pounds of lead to each 100 pounds. About 25 per cent. break on bending and some fractures are spongy while others are fine. Can you suggest a remedy? Before pouring we add the lead and 1 ounce of aluminum to make the castings run well.

A.—Standard leaded rod brass contains from 1.75 to 2.75 per cent. of lead. If you add 8 pounds of lead to this metal your alloy will have over 10 per cent. of lead in it, and such an alloy could not be expected to have either strength or toughness.

If you will run down your material into ingots before using, then add 10 pounds of copper and 3 pounds of tin to each 100 pounds of ingot metal (leaving out the aluminum) your troubles should cease.—J. L. J. Problem 2,305.

CASTING

Q.—Would you kindly inform me if there is a cheap method for casting rod brass, 10 to 12 feet long, in sand, and what advantage would the rolled rod have over the ones cast, for work that did not require great strength.

A.—A recently examined sample of commercial rolled rod brass showed 65.50 copper, 2.50 lead and 32. per cent. zinc. You could make a sand casting 10 to 12 feet long in a similar mixture, provided the diameter was not too small. It would be well to add a small amount of tin or aluminum to secure greater fluidity and to raise one end of the mold as is done in casting long brass liners. The shrinkage of so long a casting is considerable, and if the mold was rammed too hard or if the casting was gated in such a way that it could not shrink freely it might be full of hair cracks or even pull apart. At best such a casting would have very little strength in tension or stiffness.—J. L. J. Problem 2,306.

BABBITTING

Q.—Have you a list showing the pressure strength of various grades of babbitt giving the composition thereof?

A.—The standard form of compression test piece recommended by the American Society of Testing Materials in the 1915 Year Book is one that has a diameter of not less than 1 inch nor greater than 1.13 inch, though the 1 inch diameter specimen is preferred. The length of the specimen should be between 2.5 and 4 inch diameters.

There are no published comparative tests of the compressive strength of the various standard babbitts. Results of tests have been published at various times, but the composition of the babbitt is either not given or the tests have been made on cubes or specimens of miscellaneous sizes and hence they are of very little value.

A committee of the American Institute of Metals and the Bureau of Standards, Washington, D. C., has under consideration the question of obtaining accurate data on the physical characteristics of the babbitts most commonly used and standard methods for the sampling and analysis of babbitts. The active interest and co-operation of the various manufacturers of babbitt in this work would no doubt lead to its more rapid prosecution and advance the interests of both the producers and consumers of this valuable commodity in the United States.—C. H. P. Problem 2,307.

CLEANING

Q.—What is the effect of sodium cyanide solutions on die castings of 85 per cent. zinc base? Our foreman uses it for cleaning die castings before plating. I cannot see any possible reaction between greasy substances and oxides, and between sodium cyanide. In my opinion the free sodium hydroxide does the cleaning, and in this case the expensive cyanide could be substituted with the cheaper and more efficient.

A.—Sodium cyanide is an expensive material to use in cleaning die castings. The cyanogen contained in the sodium cyanide removes the slight oxidization and the free sodium hydroxide does the cleaning.

A solution prepared from 2 to 4 ounces of commercial sodium hydroxide or an equal amount of causterized soda ash per gallon of water will give better results, to prevent the formation or reduce the oxide one-half ounce sodium cyanide in connection with sodium hydroxide will give excellent results.

The addition of one-half ounce of commercial sodium silicate, that is, water glass, has also proven a very effective medium in connection with the sodium salts mentioned and makes a very effective cleanser. The amount stated above should be added per gallon of water.

We would suggest that the use of sodium cyanide be discontinued until it is cheaper.—C. H. P. Problem 2,308.

COLORING

Q.—We are manufacturers of gold chains and have been experimenting with various alloys of white gold, and while we have found an alloy which works very satisfactorily in our larger patterns when it is used for fine neck chains there is a greenish tinge to them. We have attempted to color them, but the anodes which we have give the chains a brownish appearance, and we are wondering if we would be able to obtain anodes which would give the chains the appearance of platinum.

A.—The greenish tinge noted in the manufacture of fine chains from white gold alloys is due to the silver, which is probably in excess. In all probability if the gold used in the alloy for the fine chains was slightly increased the greenish tone resulting would not be so noticeable. In other words, you are getting a tone similar to a light green gold, such as would result from a silver deposit from a combination of silver and gold in solution.

Nickel resembles platinum in color more than any other metal and rolled nickel anodes would no doubt help to give the correct color if a few grains of cadmium chloride were used in a dilute and warm nickel solution especially prepared for the purpose. The chains might be given a flash deposit that would answer the purpose and we would suggest that you try the following solution:

Water	1 gallon
Double nickel salts	2 ounces
Single nickel salts	½ ounce
Sal ammoniac	¼ "
Boracic acid	½ "
Chloride of cadmium	10 grains

Temperature 110 degrees and voltage 2.—C. H. P. Problem 2,309.

FINISHING

Q.—Can you give us any information in regards to coloring copper, a black-green finish without the use of current?

A.—In producing a black-green finish upon copper without the use of current proceed as follows:

First—Cleanse the copper by scouring with pumice stone and a tampico brush or wheel. Second—Immerse in a solution of Polysulphide consisting of one gallon of water and a half ounce of Polysulphide. Dissolve the Polysulphide in a little hot water and then add the balance cold. Third—After the black tone is produced upon the copper, which should take but a half a minute,

remove wash and dry in the regular manner. Fourth—Lacquer with a French varnish thinned down with a little fusel oil. Fifth—Mix up a thin fluid paint from dark chrome green with a little turpentine and a few drops of turpentine copal varnish. The color of the paint mixture may be varied by using different shade of dry chrome greens, soluble blues, zinc white and black in combination.

The paint at any time should not become tacky but must dry out opaque, and should be applied to the blackened copper articles after the lacquer is thoroughly dry. After the green has been applied and the articles are dry they should be waxed down with a waxing brush and a little beeswax.—C. H. P. Problem 2,310.

FLUXING

Q.—We have about 600 pieces of soft steel parts to be brazed and the same are to be then drilled and tapped. We are using borax for a flux, but this leaves the stock so hard that we lose a great deal of time in drilling and tapping, and in some cases it is impossible to do the drilling and tapping at all. There is a flux used, we understand, that will leave these brazed parts in a perfectly soft condition. Can you tell us what to use for a flux to overcome this difficulty? We have tried all methods of cooling off and we find that any flux that contains borax is of no use. We use Tobin bronze for brazing.

A.—The difficulty that you have with drilling and tapping your soft steel parts that have been brazed with Tobin bronze, using a borax flux, is probably due to the film of borax that adheres to the work. Borax is generally used more liberally than is really necessary. Often it can be dissolved in water and when applied in this way much less is used. A heavy initial cut will often serve to get under the scale of flux. Boracic acid is preferred by some persons to the borax flux.—J. L. J. Problem 2,311.

MIXING

Q.—We would like to know of the best bronze composition to be used for engine piston rings in large cast iron cylinders, operating at high speed under superheated steam at 550 degrees Fahr.

A.—A number of casting mixtures containing more or less nickel and known usually as "nickel bronze" have been used for superheated steam work. The higher the percentage of nickel the more difficult it is to obtain sound castings, but the higher nickel content alloys give the better service.

The following mixture has been recommended as a practical one:

Copper	38
Nickel	46
Tin	15
Lead	½
Aluminum	½

Tin is readily attacked by superheated steam. Hence, it is necessary that any mixture containing it should be thoroughly alloyed. Thorough alloying may also prevent any sweating out of tin or a tin-lead alloy, in case both tin and lead are present in a mixture. Remelting for this reason is advantageous. While I am not aware that pure wrought nickel rings have been used for superheated steam work, they ought to give satisfactory results, for wrought nickel has been used for steam turbine parts. The nickel could be melted in magnesite crucibles, deoxidized and cast into discs. The centers could be punched out, forming thick rings, and these could be forged into rings of the required size on the Bradley hammer.—J. L. J. Problem 2,312.

MOLDING

Q.—We would like to know the best method of coating the inside surface of iron molds with some form of carbon or other material to protect the mold surface from coming in contact with molten gold alloys as they are poured into the mold. Another object of the coating is to make a smooth surface on the inside surface of the mold, that is, to fill up any minute imperfections in the cast iron.

It is a simple matter to paint the inside surface of the mold with a mixture of graphite and oil, or lamp black and oil, but what is wanted is a firmly adhering coat which will not be easily removed by the molten metal the moment it enters the mold. Heating the mold and burning oil on its surface, or smoking the hot mold with burning pitch or lamp soot, seems to serve well in some cases, but it is not satisfactory for all cases, since the carbon put on the mold in that way does not seem to adhere firmly enough in the case of certain gold alloys. Can you tell us any better way?

A.—In carbonizing molds of iron, for casting bars, ingots, etc., the process might be compared to what is done by a cook by repeated use of her griddle without scouring.

Heat molds, and flow over the inside surface, mold oil; allow each successive coating to dry on. Several coatings should be sufficient for gold castings. See that the carbonizing has taken place uniformly over the entire surface. After this, when the molds are ready for use, heat them before using, and grease always before pouring, with pure lard, or lard oil. Heavy mold or cylinder oil of a high flash test is best for this carbonizing process.—H. D. C. Problem 2,313.

PLATING

Q.—We would like to know what method to use and time to run work in order to successfully copper plate 60—80 point carbon spring steel which is afterwards plated with either brass or nickel and which is exposed to wet and dry weather every day.

A.—Neither copper, brass or nickel gives a successful coating upon steel that will resist atmospheric influence and prevent the formation of rust. The large hardware manufacturing companies have realized these facts and are at the present time giving their product a preliminary coating of zinc from an alkaline cyanide zinc solution which is followed by direct deposition of copper, brass or nickel or coating the zinc with copper or brass and then nickel plating.

This method is the most effective for all purposes of plating upon steel when exposed to dampness or the action of salt air.—C. H. P. Problem 2,314.

RESISTING

Q.—Kindly advise us as to the best way of making a concrete floor secure against the ravages of oil of vitriol and nitric acid. These acids are chewing up the present concrete floor in our dipping room, softening the concrete and creating cracks through which the solutions drip into the floor below.

A.—Concrete floors have proven a distinct failure for plating room floors, as they are rapidly acteed upon by mineral acids especially when partly diluted.

The only remedy you can apply is to fill up the cracks that the acids have eaten in the concrete and then apply a layer of asphalt about ¼ to ½ inch thick.

The best and most satisfactory flooring that never gives out is to lay acid proof brick edge-ways and then fill in between the bricks with boiling asphaltum mixed with coal tar.—C. H. P. Problem 2,315.

TINNING

Q.—Will you kindly advice us what flux to use for tinning black sheet iron with block tin? We have tried cleaning with emery cloth and used sulphuric acid, muriatic acid and other chemicals, but have been able to tin only in spots, and failed to tin the whole tank which we are making.

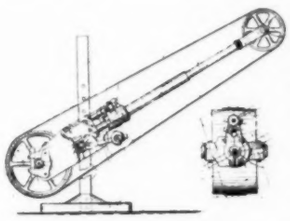
A.—The regular formula in common use for tinning sheet iron plates can be applied to your tanks. The iron plates are first immersed in a cleansing bath of equal parts of sulphuric or muriatic acid and water, used warm. On taking the articles from the acid solution they should be dipped in a bath of hot lime water. They are then rubbed with dry saw dust and the surface should be almost chemically clean. If there are scales or grease spots which prevent a uniform cleansing action of the acid they should be removed with emery cloth. The plates are then immersed in a bath of equal parts of saturated solutions of chloride of lime and chloride of ammonium from which bath they are transferred to the melted metal bath. You can apply the same process in a way best adapted to your tanks for tinning and get a good covering of tin all over the inside.—P. W. B. Problem 2,316.

PATENTS

A REVIEW OF CURRENT PATENTS OF INTEREST.

1,179,999. April 18, 1916. **Grinding and Polishing Machine.** John C. Blerney, Newark, N. J.

This invention has reference, generally, to improvements in grinding and polishing machinery; and, the present invention has for its principal object, to provide an efficient and simple mechanism whereby an endless abrasive belt may be properly and effectively operated for the purpose of providing objects of various kinds and shapes with a highly finished surface by grinding or polishing the same upon said abrasive belt.

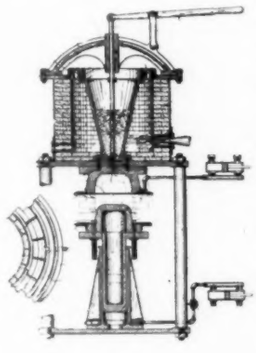


The various specific objects of the present invention not at this time more particularly enumerated will be clearly understood from the cut here shown.

1,180,352. April 25, 1916. **Vacuum Molding Machine.** Conrad Werra, of Waukesha, Wis., assignor to Werra Aluminum Foundry Company, of Waukesha, Wis., a corporation of Wisconsin.

This invention relates to improvements in vacuum molding machines of that type more particularly adapted for molding household utensils.

It is one of the objects of the present invention to provide a vacuum molding machine, as shown in cut, in which metal utensils of various kinds having very thin walls may be easily molded in a very simple manner.



A further object of the invention is, to provide a vacuum molding machine having means for melting and keeping a supply of molten metal for directly supplying the molding dies with metal as soon as the completed utensils are removed from the dies to form substantially a continuous operation.

A further object of the invention is to provide a vacuum molding machine in which pneumatic means is utilized for moving one of the molding members to molding position, and also to cause the molten material to flow into the molding space of the dies.

1,180,435. April 25, 1916. **Process of Recovering Metals.** Clinton S. Robison, of Chicago, Ill., assignor to the Metallic Smelting and Refining Co., of Chicago, Ill., a corporation of Illinois.

The patent covers: The process of recovering aluminum from substances containing aluminum in its elemental state, which consists in mixing cyrolite with the substance and charging the mixture into a molten flux of sodium chlorid, there being sufficient sodium chlorid to entirely surround the charge, the sodium chloride remaining chemically inert and the aluminum being melted by the latent heat of the sodium chlorid and settling to the bottom, while the remainder or slag is held in suspension in the flux, or floats thereon.

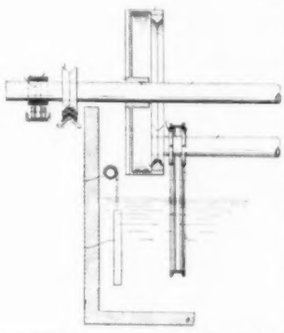
1,180,996. April 25, 1916. **Composition of Matter.** Harry W. Gaskill, of Cleveland, Ohio, assignor of one-half to Charles F. Johnson, of Cleveland, Ohio.

This invention relates to a new and a useful composition of matter, more particularly a white metal alloy which is called manganese silver, the object of the invention being to produce a novel and metallic compound or alloy which may be used advantageously as a substitute for nickel and which is extremely hard, preserves its color, resists oxidation, and the tarnishing and corrosive effects of many gases and liquids and which is capable of being readily machined, is also adapted to be rolled in sheets, is ductile, malleable, and which also may for certain specific purposes be advantageously used as a substitute for steel.

The improved composition consists of copper, nickel, zinc, manganese copper and in some instances also aluminum and phosphor tin. For making a composition which will machine there is used of copper 56 parts, nickel 15 parts, zinc 25 parts, aluminum 1/10 per cent., lead 1¼ per cent., manganese (pure, carbon free, and free from iron) 4 ounces, and magnesium 1 ounce. There are formulas given for making other forms of composition.

1,181,349. May 2, 1916. **Mechanical Plating Apparatus.** P. T. Sealey, Akron, Ohio, assignor to Firestone Tire & Rubber Company, Akron, Ohio.

This invention relates to machines for electro-plating articles continuously, and more particularly for electro-plating annular objects, such as tire rims, though it is not limited to the treatment of these articles specifically.



The objects of the invention are to provide a machine, as shown in cut, for carrying on the processes incident to electro-plating, without the necessity of handling articles from the time they are placed in the machine, until they are discharged. In order to do this, it has been the aim of the invention to provide means for pickling, washing, electro-plating, and finally washing the articles.

It has also been one of the objects of the invention to provide means for rotating the article while under treatment, and while rotated in the pickling and electro-plating tanks to maintain the electric circuit through the tanks and articles, in order that the pickling and plating may be carried out uniformly over the entire surface of the article.

1,181,889. May 2, 1916. **Coating for Protecting Bronze Surfaces.** O. Hommel, Pittsburgh, Pa.

This invention relates to a new method and an improved composition for protecting surfaces covered or treated with bronze powders or metal leaf. In this connection bronze powder is a general term used in the trade for referring to all classes of powder or ground metal, such as copper, brass, bronze, aluminum, tin, etc., or alloys of these metals, and is not limited to bronze alloy alone, as would ordinarily be indicated by the term. The patent covers:

The combination with an article having a bronzed surface of a pasty coating thereon comprising five parts of bees-wax and one and one-quarter parts of carnauba wax dissolved in seven parts of turpentine.

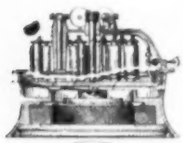
1,183,217. May 16, 1916. **Composition for Metal-Coating of Ferrous Articles.** James H. Maddy, of New York, and Bruno H. Schubert, of Weehawken, N. J., assignors to the Lohmann Company of New York, N. Y., a corporation of New York.

The object of this invention is to furnish a composition of powdered fusible metal combined with a liquid medium, so that

the metal may be used for coating iron and steel articles by application thereto in a plastic condition, and the use of a blow-torch or other suitable means for melting the protective metal upon the surface of the article. This object is attained by mixing powdered metal, as lead, zinc, tin or antimony with a mercury bi-chlorid solution, which serves partly as a medium by which the powdered metal may be painted upon the surface of the article to be coated, and also serves to cause a chemical union of the metal coating with the iron or steel article, and this because mercury operates as hereinafter set forth, to promote the union of the protective metal with the article.

1,182,137. May 9, 1916. **Grinding and Polishing Machine.** A. C. Boyle, Jr., Laramie, Wyo.

The principal object of the present invention is to provide in a machine, as shown in cut, of the character stated, a lap-wheel of novel construction, and therewith co-operative means which permit of the selection of different kinds of abrasive material while the machine is in operation, and which automatically conveys the selected abradant to the point at which the grinding action takes place, after it has been impelled by centrifugal force toward the peripheral portion of the wheel.

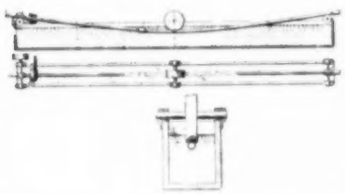


By the use of the invention the abrasive material is automatically and continuously supplied to the points of the grinding surface of the wheel at which it engages the specimens or other articles under treatment.

Different kinds of abrasive material are automatically classified according to their specific gravity and the sizes of their solid constituents. The selection of the abrasive material during the movement of the wheel makes it possible to effect coarse and fine grinding, and consequent rapid and slow execution of the work while the machine is in operation, and the necessity of supplying fine abrasive for final grinding after the machine has been in operation for some time, is avoided.

1,184,315. May 23, 1916. **Method of Galvanizing Pipe.** Newton W. Buch, of New Castle, Pa., assignor to Safety Armorite Conduit Company, of Pittsburgh, Pa., a corporation of Pennsylvania.

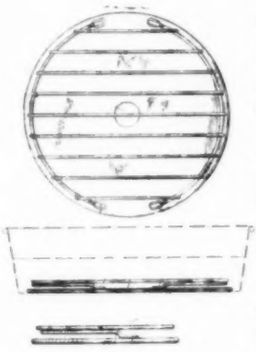
The invention relates to the treatment of pipes, and is designed to provide a continuous method of novel character by means of which the work of galvanizing may be rapidly and thoroughly performed. In carrying out the invention there is provided a suitable tank or vessel, as shown in cut, which contains the bath of hot galvanizing material, and which is provided at its ends with suitable guide rollers, over and between which the pipes to be galvanized are passed in entering and leaving the tank. One of the rolls at the leaving end of the tank is positively driven by any suitable means such as a pulley.



The pipes to be galvanized are first provided with threaded ends, and successive lengths of the pipe are united by couplings. The tank or vessel is of sufficient length to receive a great enough length of pipe or coupled pipes between the guide rollers to permit of the deflection of the central portion of the pipe below the surface of the molten bath. This deflection can be effected in part by gravity, and partly by the use of a centrally arranged depressing wheel or roller. In some cases this roller may be dispensed with, as the weight of the pipe alone will be sufficient to cause the central portion to be sufficiently deflected into the bath.

1,182,173. May 9, 1916. **Silver Cleaner.** J. B. Horn, Philadelphia, Pa., assignor to the Frank A. Rolling Company, Inc., of the same place.

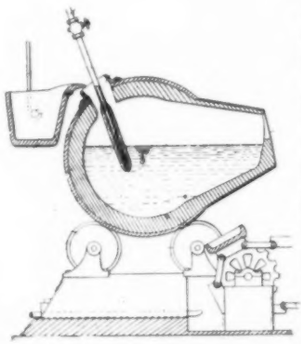
It is the object of the present invention to provide means, as shown in cut, whereby tarnished metal articles, such as silverware, either solid or plated, mesh bags, toilet articles and the like, and articles of gold and other electro-negative metals, may be quickly and effectively cleaned of the tarnish by electrolytic action instead of or preparatory to polishing.



The silver or other articles to be cleaned are immersed in an alkaline solution in conjunction with an apparatus so constructed that the silver or the like becomes the cathode of a voltaic couple, and the coating or tarnish is electrolytically reduced by the electric current thus set up, and the silverware thereby rendered clean and bright. According to the present invention, the apparatus whereby this result is effected is economcial to manufacture, compact in design, rugged in construction, efficient in its electro-chemical action, and convenient to use and clean.

1,183,736. May 16, 1916. **Process of Refining Copper.** E. C. King, Cananea, Mexico.

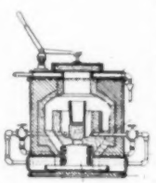
The present invention relates to the art of refining or eliminating impurities from copper, and it consists essentially in introducing hydrocarbon oil under suitable pressure into the body of a bath of molten copper. According to the present invention hydrocarbon oil, preferably crude petroleum, is introduced directly into the body of the copper while in a molten condition, as shown in cut, and this hydrocarbon oil not only acts to eliminate gaseous or metallic impurities without injury to the copper, but after all impurities, excepting oxygen, have been removed, and the bath is protected from all oxidizing influences by covering the bath with carbonaceous material not containing impurities that could be taken up by the metal, continuation of the operation of introducing hydrocarbon oil directly to the body of the molten copper forming the bath expels the last impurity, namely, oxygen, and when the oxygen has been expelled the purifying operation is at an end.



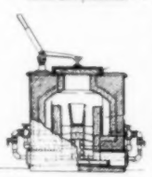
1,182,893. May 16, 1916. **Melting Furnace.** Alexander W. Carroll, Elizabeth, N. J.

This invention relates to melting furnaces and particularly to furnaces for melting metals such as brass.

An object of the invention is to provide a melting furnace occupying approximately the same space as a coal furnace, but designed to use gas as a fuel, and so arranged that the pots containing the metal are heated evenly at all points, without danger of being fractured.



Another object of the invention is to provide a furnace, as shown in cut, which shall require a comparatively slight amount of care in the operation thereof, and which may therefore be operated more frequently and more efficiently than the furnaces now in general use.



Another object of the invention is to provide means for introducing the combustible gases into the combustion chamber of the furnace in such a direction that they are given a whirling movement within the chamber, and to so arrange the flue as to produce a down draft in the chamber.

EQUIPMENT

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST.

"RESISTO" PLATING RACKS AND HOOKS

A Practical Solution of Some Difficult Problems.

Written for The Metal Industry By Franklin W. Hobbs, Foreman Plater.

The variety of sizes, shapes and weights of articles that have to be nickel-plated being almost endless, it follows that to produce best results at the least cost, quite a variety of racks and hooks are necessary for supporting work in the tanks. It is a simple matter to form a rack or hook by which the average work may be supported, and which will at the same time conduct the necessary amount of current. There are, however, not a few articles which tax the plater's ingenuity. In designing patterns for castings to be nickel-plated the plater's art is given due consideration so far as the finished product is concerned, while the question of how the work is to be supported in the tanks seems to have been ignored, judging from pieces that come to us.

The large amount of waste deposit on the supporting devices is a matter of considerable importance, and the inquiries for methods of prevention are proof of the demand for improvement along that particular line. Plating racks loaded with thirty or forty pounds of nickel are not uncommon. To be sure they may be sold for old metal, but as the price received is less than one-half the original cost and new racks have to be constructed, some method of preventing the waste would seem worth considering.

Briefly the requirements of a plating rack or hook are: Size sufficiently large to conduct required current and support weight. Form to hold projecting points, cavities and receding edges as near equal distances from anodes as possible; point or points of contact to be so placed as to interfere as little as possible with deposit on face of work; points of contact made integral part of device and joint soldered. The whole device except cathode hooks and actual points of contact to be insulated with some lasting non-conductor which is not only a non-conductor, but also proof against the action of plating solutions and hot water; also, in case the electric cleaner is used the insulator must be proof against the action of that most efficient cleaning system.

A convenient form of rack for long range bands or similar articles which are too long to be hung upright, is formed by bending a brass rod of suitable size into three sides of a square; the ends bent into hooks to engage cathode rod; the sides bent into equal angles or brackets forming a series of hooks all but the points, which are supplied by soldering on short pieces of about sixteen gauge brass wire to the projections. After thoroughly insulating the whole rack except cathode hooks the insulation is removed from inside of contact point with a sharp file. If the solder joints are allowed to remain covered they may be easily removed with the pliers when they become too heavily coated with metal; new ones are then soldered on and the joint reinsulated. If the solder joint is not covered it will become so coated with deposits to make it difficult to remove the hook when desired. The principal part of such a rack is preserved almost indefinitely.

In a previous article[1] I described two other forms of racks which are very satisfactory, except that I would advise the new method of insulation which I will describe later in this article.

The friction tape which I previously used was a help, but was not permanent, as after repeated immersions in plating solutions and hot water it loses its adhesive element and allows deposition to take place while in the electric cleaner it is immediately destroyed. Hooks may be made in the same manner as the rack described, the points being soldered on, and discarded for new ones when desired.

[1] The Metal Industry, October, 1911.

One of the difficult problems that has come my way was a long elevated shelf band with ends projecting at right angles. They are generally hung in ends down with an ordinary hook, but in order to economize space and get out more work it was desired to hang in an equal number ends up under the others. There were no holes or projections of any description except that the very ends for one-fourth inch were reinforced or made double thickness, thus forming a slight shoulder inside. A hook was formed by bending one and one-half inch of a number ten brass wire back on itself; three-fourths of an inch was bent down again and the very end and first loop bent in toward each other somewhat like the thumb and first finger grasping the head of a tack; the other end of the wire, of course, being formed to engage the cathode rod. These were slipped over edge of ends and by careful handling worked satisfactorily.

The most difficult problem has been to secure some insulating material which will defy electro deposit and various solutions and the combined effect of hot caustic alkali and the electric current as applied in the electric cleaner. I have tried all sorts of materials which in some cases proved in a measure satisfactory when only the hand cleaners were used, but which promptly failed when subjected to the electric cleaner.

I was fortunate, however, in enlisting the co-operation of John W. Masury & Son of New York, the well-known paint manufacturers. Experiments followed both by them and myself, the outcome of which has been the compounding by them of a preparation which stands some severe tests. This compound is of high electrical resistance. It contains no saponifiable fatty matter, and stands the action of dilute acids satisfactorily. When applied to metal and the whole baked at a temperature of about 200 deg. F. for several hours it will stand the action of a strong solution of boiling caustic potash without injury, also boiling mineral cleaner.

By first taping plating racks and hooks with common cotton tape and then subjecting the taped device to three coats of this compound baking each for three hours at a temperature of about 200 deg. F. it will resist the action of the electric cleaner. The plain tape may be applied by moistening the end with a little of the compound doing the same with the last end which will hold it in position while the whole is being coated. If the compound is applied direct to the metal, the electric cleaner gas tends to force it off in flakes, but when first taped it is effectually overcome.

It is not satisfactory over friction tape owing to the adhesive material in the tape preventing its becoming solid, although if hooks or racks have been taped some time and the sticky substance has been practically eliminated and no deposit has yet taken place upon them they may be treated with the compound with satisfactory results.

This compound has been given the name of "Resisto Coating" by its makers, John W. Masury & Sons, New York, and costs approximately $1 per gallon. As received it is rather thick and may be thinned with turpentine when applied with a brush. The electric cleaner which I have used in testing and using "Resisto Coating" is "mineral cleaner," it being the one I use in regular every day work, having been chosen from among several as the most efficient cleaner for either hand or electric methods; and to the active plater with sore hands and curly and yellowed nails, as a result of the use of the various compounds of potash and soda, this cleaner is a godsend.

To those who wish to test out "Resisto Coating" in other cleaners the opportunity is open, and if my article has furnished even a clue to the problem of preventing waste deposit my effort will not have been in vain.

TESTS OF HIGH TEMPERATURE FURNACE CEMENT

W. S. Quigley, president of the Quigley Furnace Specialties Company, 26 Cortlandt street, New York, N. Y., in an address before the Philadelphia Foundrymen's Association, Philadelphia, Pa., May 3, 1916, made some very interesting statements relating to "Hytempite" furnace cement which his firm has just put upon the market. Mr. Quigley, during the progress of his speech, prepared sample bonds using his cement and various kinds of firebrick and he stated in reference to the qualities of the cement that it forms a lasting union between the materials to be joined, sets at normal temperatures, that is, air sets, and retains its strength regardless of the heat to which it is subjected.

The cement is of the same nature as the best qualities of fire clay brick or tile; in fact, what is more important, it makes it as good all the way from the inside of the furnace where it is exposed to the high heat clear through to the outside of the wall, which may never become much hotter than the surrounding atmosphere.

It comes prepared or tempered ready for use, is very plastic, trowels easily and insures a tight wall or structure which will not admit passage of gases or any foreign substance, such as dust, ashes, etc. It strengthens the wall or structure, will withstand the action of expansion and contraction and can be put under heat while wet without injury.

Tests have proven that this material used as a binder (in place of fire clay) when air set forms a joint as strong as the material united, and that the strength is not impaired *but increased* by the action of heat. This property makes a wall or structure impossible to obtain with fire clay, which must be fused before a bond

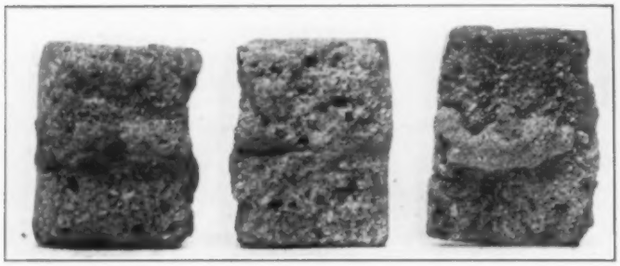


Fig. 1. Fig. 2. Fig. 3.

SOME TESTS OF HYTEMPITE.

Fig. 1. Heated to 800° F. Fig. 2. Heated to 1,800° F. Fig. 3. Heated to 3,000° F.

not penetrate to any considerable depth the effect is only a surface bond, as those of you know who have had experience in dismantling a furnace.

It withstands the cutting action of flames, and is especially adapted for oil furnaces when the gases are generally of high velocity, for furnace roofs, door arches, bung tops, boiler settings, etc.

It can be used as a coating or wash to smoothen and harden the surface of a furnace lining to protect it from abrasion; in fact, it can be used wherever fire clay bricks are used.

After Mr. Quigley had prepared his samples he placed them in electric furnaces which had been provided by the Electric Heating Apparatus Company of New York, N. Y., and heated them up to various temperatures, the highest being about 3,000 degs. Fahr. The accompanying illustrations show the results of these tests. In the picture, Fig. 1, is shown a sample of "Woodland" brand of fire brick which was heated to 800 degs. Fahr. and it can be plainly be seen that there was no expansion or spreading effect caused by the cement and that the cement did not boil out from between the pieces of brick.

Fig. 2 shows a sample of the same kind of brick, but which has been heated to 1,800 degs. and still no bad effects are shown. Fig. 3 shows a sample that has been heated to 3,000 degrees and it will be seen that the brick has so softened as to be pinched by the tongs while the cement bond remains intact. The cement, which appears to be squeezed out from between the two pieces of brick, did not flow out in the heating process, but was purposely left hanging in order to show what effect the high temperature would have upon it.

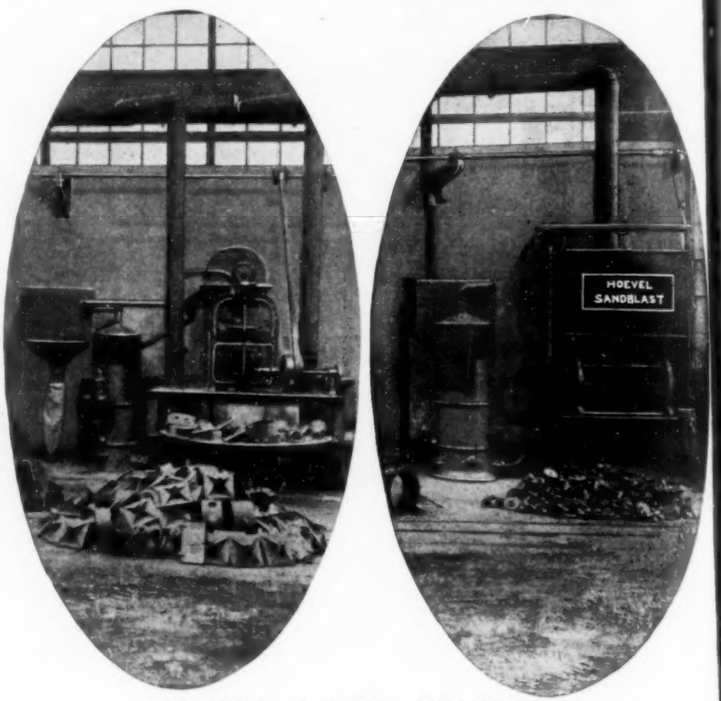
Altogether the three samples shown in the cut represent the following zones of temperature that are met with in an ordinary furnace. Fig. 1 would be the temperature of the outer shell, Fig. 2 the temperature of the middle part of the shell, while Fig. 3 shows the temperature at the point of contact with the fuel. Further information relating to this new cement may be had by corresponding with Mr. Quigley at the above address.

SAND BLAST MACHINES

The Hoevel Manufacturing Corporation, 50 Church street, New York, N. Y., have recently issued catalog B which contains very interesting descriptions and illustrations of the line of sand blast machines which they are now manufacturing.

The accompanying photographs show two types of these machines, that in Fig. 1 illustrates their rotary table machine, while Fig. 2 shows the one known as the revolving barrel.

The manufacturers state that the smallest type is exceedingly well suited for foundries producing hardware castings and for brass foundries. It is provided with a rotary table up to 40-inch



TWO TYPES OF HOEVEL SAND BLASTS.

Fig. 1. The Rotary Table Type. Fig. 2. The Barrel Type.

diameter, which will be completely covered by a rotating nozzle. The operation is most simple, inasmuch as besides looking after or taking finished castings out of the machine, only a lever has to be turned, whereby the automatic sandflow is regulated by a very cleverly designed valve. The sand connections are easily accessible, being outside of the machine and any clogging can immediately be done away with. Furthermore the design enables one to use the open nozzle without any preparation to speak of, so that larger pieces can readily be cleaned. The sandblast works in a completely closed apparatus. The dust that is stirred up inside will be removed by an exhaust.

In relation to the revolving barrel machine they have the following to say: "A distinctive feature of the revolving barrel, type 'Hpo,' is the fixed or stationary nozzles. This leaves the barrel entirely free from obstruction of any kind, so that, no matter how the castings may pile up in the barrel, they can do no damage. The design of the barrel with oblique shaped side walls is such, that all castings are constantly brought under the sandblast so that an even distribution of the blast over all the castings in the barrel is positively assured. The nozzles are readily accessible from the outside of the housing, and replacement of nozzles is therefore very easily and very quickly done. These advantages are obvious and will at once recommend themselves to the purchaser. The dumping or emptying of our revolving

barrel is a simple and rapid operation. The movement of a single lever causes the barrel to empty itself and deposit all the castings on the floor in front of the barrel. The installation can be so designed that this dumping will be done into a receptacle, that can be carried away by a crane or wheeled away, as may be desired. The general simplicity of this barrel and the absence of complicated parts are features that will appeal to every user of machinery, particularly foundry machinery, for it is in foundries that the dust in the atmosphere works a havoc with complicated mechanisms.

FIRE SCREEN DOOR

A glance at the photographs shown herewith will enable one to instantly realize the utility of the apparatus shown. The first picture shows a screen made of chain which is rolled up and placed upon the top of the fire-door opening of a furnace,

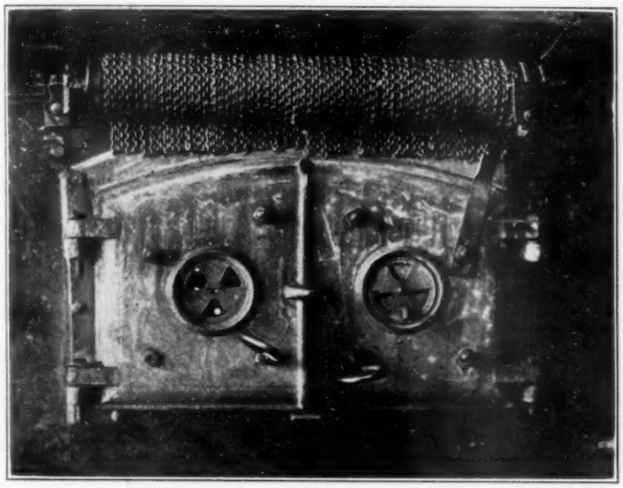


FIG. 1. THE CHAIN FIRE SCREEN ROLLED UP.

whether it be an annealing muffle furnace or a boiler. Our second picture shows the screen fire-door in operation. The screen is let down by the roller and completely screens the opening of the furnace, and practically no heat is allowed to come through the hanging chains.

Contrary to what might be first impression, the chain screen offers no obstacle to the various operations which are connected with the running of a furnace, that is, charging, breaking, cleaning the fire or changing the contents of the oven. As is seen in Fig. 2 the fireman is putting coal on the fire, and the shovelful of coal merely causes the chains making up the screen to separate and allow the coal to go through immediately, falling back into place when the pressure of the coal passing through is released.

In relation to the operation of this screen the manufacturers, E. J. Codd Company, Baltimore, Md., have the following to say:

"In a boiler-room, where the Wiegand chain doors have been in use some two years or more, experiments were made in order to obtain an idea of the effectiveness of this device in avoiding the losses arising from the opened fire door. A thermometer was fixed on a standard in the fireroom at a point opposite the fire-door and ten inches distant therefrom. This position was chosen as being one often taken by the fireman in stoking or cleaning the fire. When the ordinary fire-door was thrown open and the incandescent fire bed exposed, as is the case whenever the furnace is coaled or cleaned, this thermometer rose to 400 degs. F. On covering the furnace opening with the 'Auxiliary Chain Door,' the temperature at once dropped 265 degs. F. to 135 degs. F., and the bare, unprotected hand could be held any-

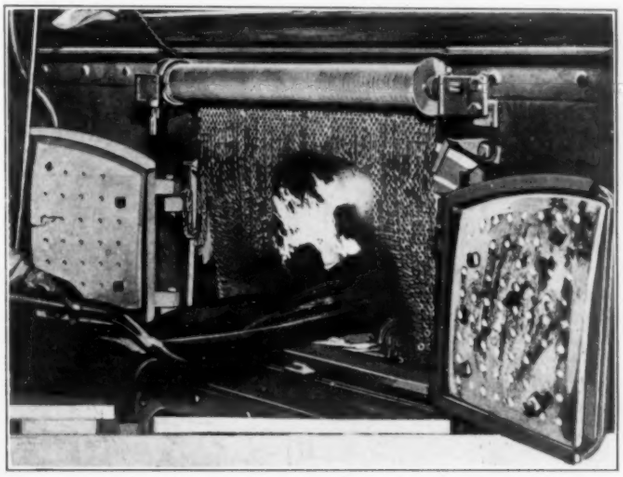
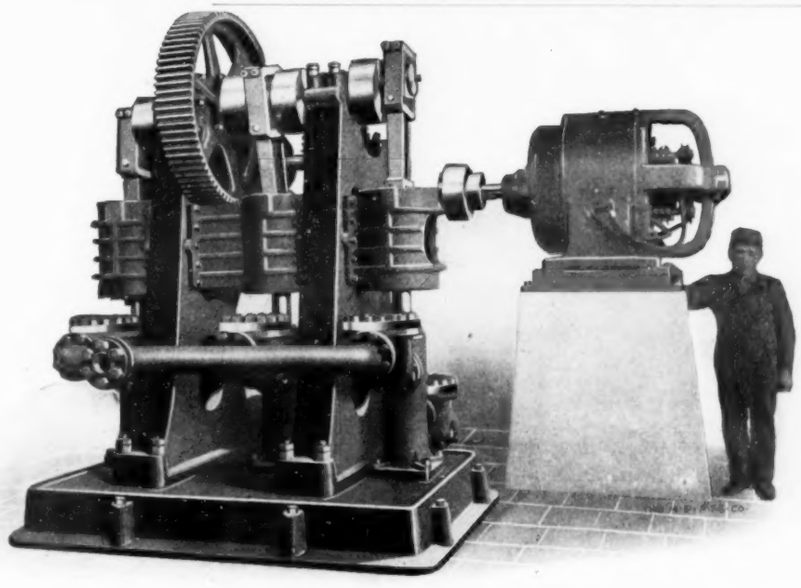


FIG. 2. THE CHAIN FIRE SCREEN IN POSITION FOR USE.

where in front of the screened opening without discomfort. This indicates that the great quantity of heat lost by radiation and convection, through the ordinary uncovered furnace opening may be saved by the employment of such a device. The heat intercepted by the chains composing the screen is returned to the furnace, instead of being wasted, as the air that does enter, in passing through the holes in the sheet of chain, takes up the heat that has come to the chain from the fire bed, and carries it back into the combustion chamber."

NEW POT VALVE TYPE MOTOR DRIVEN VERTICAL TRIPLEX HYDRAULIC PUMP



NEW POT VALVE TYPE MOTOR-DRIVEN VERTICAL TRIPLEX HYDRAULIC PUMP.

The accompanying photograph, Fig. 1330-A, shows a new vertical triplex hydraulic pump designed and built recently by the Hydraulic Press Manufacturing Company, Mount Gilead, Ohio. It is of the pot valve type, and capable of delivering a large volume of water against a high pressure. The volume of water and pressure depends upon the diameter of the plungers with which the pump may be equipped. These may vary from

4 inches to 5¼ inches. With each plunger making 45 strokes per minute, the 4-inch plungers have a capacity of driving 88 gallons against a pressure of 1,700 pounds per square inch. In the same length of time the 5¼-inch plungers will deliver 183 gallons against a pressure of 800 pounds per square inch. The capacity of the pump varies proportionately with the intervening sizes of plungers.

Each plunger of this pump has a stroke of 12 inches, with a normal speed of 45 strokes per minute. Thus the pump has a normal effective speed of delivering 135 feet of water per minute against a high pressure. The volume of this water in gallons of course varies with the diameter of the pump plungers.

On account of the large volume of water which this pump is capable of handling in a given time, each pump plunger is equipped with pot valves for both the suction and delivery chambers. The total area of these valves is proportionately no greater than the single valve type of pump, yet they permit the use of lighter checks which have greater freedom of movement than a large single check would have. The lift of the checks also is reduced, thereby cutting down the slippage, which occurs in single suction and discharge valves when used on pumps of large water capacity.

ROBERTS BRASS MANUFACTURING COMPANY

The accompanying illustration shows a bird's-eye view of the complete plant of the Roberts Brass Manufacturing Company, Detroit, Mich. The new additions consist of reinforced concrete buildings, which, with the former building erected ten years ago, will give the company approximately three times the present capacity.

The plant will have a frontage on Fort street of 300 feet, covering the entire block between Morrell street and Junction avenues, with 200 feet frontage on Junction avenue, and 200 feet frontage on Morrell street. The buildings contain two stories for factory purposes and a third story on Fort street, 135 feet long by 45 feet wide, which will be used for the executive and general offices only. There will be installed five electric freight elevators and one electric hoist for handling metal and other supplies for the foundry; also one passenger elevator for the offices on the third floor.

The foundry will be modern in every detail, and on account of being located on the second floor the light and ventilation will be good. This location will also make it convenient for getting the castings to the cleaning department directly below the foundry. The heating system in this part of the building will be the hot air blower and ventilating system, and the machine rooms and offices will be heated by a vacuum steam system. Ice water will be furnished to drinking fountains placed throughout all parts of the building.

The building will be fireproof throughout. In the center of the factory is a large square court reached from the main front entrance through a large ornamental iron gateway. A large illuminated clock, with a dial eight feet six inches in diameter will be a feature of the front.

The floor construction will be of the flat-slab type of reinforced concrete, with cement floors throughout the factory parts. The foundry will have a steel trussed roof of reinforced cement tile. The exterior will be faced with paving brick and cut stone trimmings. The windows will have steel sash throughout.

The offices will be elaborately finished in quartered white oak, tile and marble.

This company is not manufacturing anything in the line of war material, although they had many opportunities to enter that field, but they have chosen to devote their entire capacity to taking care of their large and increasing domestic trade, manufacturing brass valves and various special parts for automobiles, motor trucks, stationary and marine engines, tractors and aeroplanes, gas valves for gas range stoves, steam engine and boiler trimmings.

BIRD'S-EYE VIEW OF THE PRESENT PLANT OF ROBERTS BRASS MANUFACTURING COMPANY AT DETROIT, MICH.

TIRRILL GAS MACHINE

Mr. W. Wallace in a recent letter states that: "The Du Pont Powder Works, after investigating the various makes of gas machines, decided that the Tirrill fuel gas plant, manufactured by the Tirrill Gas Machine Lighting Company, 103 Park avenue, New York City, was by far the machine best suited to their needs, namely: For delivering under all conditions a standard, uniform, non-poisonous gas automatically as wanted for soldering the immense quantity of shells they turn out daily. By the simple turning of a key the gas supplied by this machine is as available as city gas. The installation never increases insurance rates.

"The machine is sold outright for cash or on convenient terms, and is made in standard sizes to meet every requirement."

ASSOCIATIONS AND SOCIETIES

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS.

AMERICAN ELECTRO-PLATERS' SOCIETY

(AN EDUCATIONAL SOCIETY.)

President, W. S. Barrows, Toronto, Canada; Secretary-Treasurer, Walter Fraine, 507 Grand Ave., Dayton, Ohio. All Correspondence should be addressed to the Secretary. The objects of this society are to promote the dissemination of knowledge concerning the art of electro-deposition of metals in all its branches. The Society meets in convention in the spring of each year, subject to the decision of the executive committee. The next convention will be held at Cleveland, Ohio, July 6-9, 1916. The branch associations hold monthly and semi-monthly meetings in their various cities.

New York Branch—H. H. Reama, president, and William Fischer, secretary, 245 East 23d street, New York.

At the last meeting held on Friday evening, May 26, the following officers were elected for the ensuing year: H. H. Reama, re-elected president; John Painter, vice-president; William Fischer, financial secretary and treasurer; Frederick Haushalter, recording secretary; J. A. Stremel, librarian; W. H. Betz, sergeant-at-arms; J. E. Sterling, assistant sergeant-at-arms; and trustees, Joseph Minges, chairman; Thomas Haddow, Charles Buchanan, N. E. Dabolt and Joseph Straub, Sr. The delegates elected to attend the Cleveland convention are: G. B. Hogaboom, Thomas Haddow and John Sterling.

St. Louis Branch—F. C. Ruston, secretary, 4405 Blair avenue, St. Louis, Mo.

The regular monthly meeting of this branch was held May 20 at the St. Louis Public Library, at which time the following officers were elected for the ensuing year: H. H. Williams, president; H. J. Richards, vice-president; F. C. Ruston, secretary and treasurer; E. J. Musick, librarian, and George Lamkemeyer, H. Duebelbeis and J. T. McCarthy board of managers. The following members were elected as delegates to the Cleveland convention: H. H. Williams, H. J. Ruston and F. C. Ruston; alternates, E. J. Musick, J. T. McCarthy and Louis Gaus. At the conclusion of the business session W. R. Abbott, a member of the Chicago branch, gave a short talk, and Mr. Richards began a paper on "Copper Plating and Cleaning," which will be continued at the next meeting.

ROUTES TO CLEVELAND.

Now that the American Electro-Platers' Convention for 1916 is less than a month off (July 6, 7 and 8) it is time that not only the regular delegates, but also the platers, whose intention is to be present at the convention, to think about the best way to travel to Cleveland. This city is most fortunately situated in that the traveler is offered a bewildering number of routes by which to do.

Perhaps the best and most interesting way would be to take

H. H. WILLIAMS, JUST ELECTED PRESIDENT OF ST. LOUIS BRANCH OF AMERICAN ELECTRO-PLATERS' SOCIETY. MR. WILLIAMS IS THE LOGICAL CANDIDATE FOR PRESIDENT OF THE NATIONAL SOCIETY FOR 1916-17.

any one of the important railroad systems to Buffalo, and this may be accomplished by either a night's run from most all of the cities or, if time is available, a wonderfully picturesque daylight ride may be had either over the Lehigh Valley, New York Central, Erie or Delaware Lackawanna railroads for the eastern traveler and over the Michigan Central for the western traveler.

Arriving at Buffalo the dusty railroad may be discarded and the traveler embark on one of the wonderful steamers now running between Buffalo and Cleveland. To be more specific one of these, the ship known as the "Seeandbee," which is the largest and most costly steamer on inland waters, having a length of deck of 500 feet and a breadth of 98 feet, accommodating 1,500 passengers, leaves Buffalo every day at 9 p. m. and arrives in Cleveland at 7:30 a. m., Eastern time. The fare on this boat is $3 one way, or round trip $5.

For those of the traveling platers who have not seen Niagara Falls or any of the other interesting points in that part of the country we would suggest something like the following itinerary. Arrange to leave home on the night of Monday, July 3, and spend the 4th (the National Holiday), and the 5th of July at Niagara Falls and surrounding points. Then leave Buffalo by the boat or sleeper, Wednesday evening arriving in Cleveland in ample time for the first day of the convention.

On the homeward jaunt the process may be reversed and in this way the traveler may arrive home both tired and happy after having traveled over the country by rail and water.

AMERICAN SOCIETY OF TESTING MATERIALS

Among the interesting things which will come up at the nineteenth annual meeting of this society, June 27 to 30, 1916, at Atlantic City, N. J., will be the report of Committee B-2 on Non-Ferrous Metals and Alloys. The report states at the outset that two new sub-committees have been formed as follows: V—On Copper Plates, Tubes and Stay-bolts for Locomotives, W. Reuben Webster, chairman; VI—On Non-Ferrous Alloys for Railroad Equipment, G. H. Clamer, chairman.

NATIONAL ASSOCIATION OF BRASS MANUFACTURERS

Commissioner William M. Webster reports that owing to the difficulty in securing accommodations for the coming convention of his society at Detroit, Mich., the time and place has been changed to Chicago, Ill., June 19 and 20, 1916.

PERSONALS

ITEMS OF INDIVIDUAL INTEREST.

John M. Perkins has resigned as general sales manager and foundry superintendent of the Turner & Seymour Mfg. Company, Torrington, Conn., to become works manager of the Gilbert & Barker Mfg. Company, Springfield, Mass.

William Skillman has retired from the Smith, Brannan Electro-Plating Company, 105 Oliver street, Newark. His place in the firm and as vice-president of the firm has been taken by Samuel F. Taylor, instructor in electro-plating in the Newark high schools.

Dr. W. W. Clark, formerly metallurgist for the Seymour Manufacturing Company, Seymour, Conn., and now manager of the Noble Electric Steel Company, Heroult, Shasta County, Cal., reports that they are making 80 per cent. ferromanganese in an electric smelting furnace at the rate of twelve tons per day.

Samuel M. Vauclain, vice-president Baldwin Locomotive Works, has been elected a director of the Westinghouse Electric & Mfg. Company, succeeding C. F. Brooker, resigned. He was born in Philadelphia in 1856 and acquired his first training in mechanical skill in the locomotive and car building shops of the Pennsylvania Railroad at Altoona, Pa. Later he became associated with what is now the Baldwin Locomotive Works, of which he has been for many years vice-president. Mr. Vauclain is a director of the Standard Steel Works Company, Midvale Steel & Ordnance Company, Bucyrus Company, and Southwark Foundry & Machine Company. Mr. Brooker is President of the American Brass Company of Waterbury, Conn.

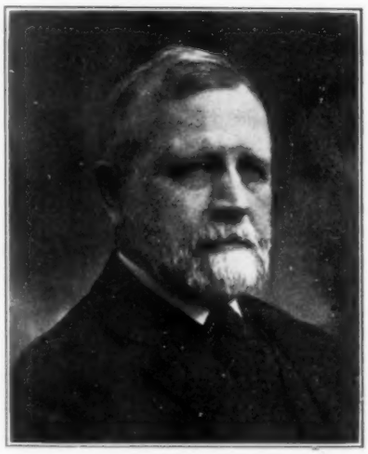
DEATHS

Edwin H. Gothberg, who was active in manufacturing circles until a year ago when he retired from active business as head of the firm of E. and H. Gothberg, brass manufacturers, of Jersey City, N. J., died at his home in South Orange, N. J., on May 17. Mr. Gothberg was born at Stockholm, Sweden, eighty-one years ago and came to New York in 1867, where he started the brass manufacturing company which was later, in 1886, moved to Jersey City where it became one of the leading enterprises of that city. He is survived by his wife, three daughters and three sons.

MORTON B. SMITH

Morton B. Smith, dean of the metal merchants of New York, died May 16 at the Skene Sanitarium, Brooklyn, N. Y., five days after he had been operated upon for appendicitis.

Mr. Smith was in his seventy-fourth year and resided at 371 Grand avenue, Brooklyn, N. Y. Mr. Smith was born in the old Seventh Ward, Manhattan, the son of Daniel Earle Smith and Julia Ann Greenlaw. He received his education at a private school at New Canaan, Conn., and when he was sixteen years old went into the metal business with his father. He went to Brooklyn forty-six years ago, and lived there ever since. Mr. Smith began his metal business career with the firm of Daniel W. Richards & Company, and later became a partner in that firm. He incorporated his business in 1897.



MORTON B. SMITH.

Mr. Smith had a country residence at Huntington, L. I., and took great interest in the village. He was a member of Huntington Country Club, the Huntington Golf and Marine Club, the Huntington Association, and was president of the Bay Crest Association of Huntington. He was also a charter member of the Municipal Club of Brooklyn, a member of the Crescent Athletic Club, the Riding and Driving Club, and the New York Metal Exchange. He was for many years treasurer of the Exchange.

Four sons and one daughter survive him. They are, Morton Hilyard Smith, a son by his first wife, Martha Hilyard, and Harold Earle Smith, Donald Jerome Smith, Archer Greenlaw Smith and Esther Marjorie Smith, all children by his second wife, who was Anna Snyder. She died three years ago.

TRADE NEWS

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS.

NEW BRITAIN, CONN.

JUNE 5, 1916.

Never were the industrial conditions of New Britain at a higher ebb of prosperity than at the present time. Each and every one of the local manufacturing concerns is working a full week and in several instances various departments, more rushed with orders than the others, are working a night shift. Some sub-contracts for war orders, but generally good business conditions, are responsible for this boom. The worst trouble that faces the manufacturers in this city at present is fear of labor difficulties and inability to get sufficient men. The fear of labor trouble is the outgrowth of last fall's serious strikes and an all-winter's campaign among the skilled workers for a better organized union, especially among the machinists and tool makers who have been working hard to establish a local union of at least 500 members by June. Inability to get sufficient help is a direct result of the tremendous growth of the wonderful war manufacturing concerns of Hartford, Waterbury, New Haven and Bridgeport. Swamped with enriching war orders, these munitions-making concerns have built enormous factory additions, and in order to enlarge the golden shower that is coming to them from warring Europe, it is necessary to get skilled hands immediately. Thus, inducements in the form of very high wages are offered, New Britain alone has lost several hundred workers during the past year, almost all of whom are now employed by some munitions manufacturing concern. Superintendents of local factories are using every effort to retain their employes, and orders have been issued to permit no man to leave where it is possible to retain him.

The strike situation became more than a mere fear during the week of May 21 when the moulders employed by the Russell & Erwin Manufacturing Company went out on a strike, demanding twenty-five cents more for day workers and forty cents a pattern for piece work. This strike has been conducted in an orderly manner, and, as yet, there is no indication that it will spread. In the meantime adjustments are being made.

Topic of considerable speculation in manufacturing circles here is the possibility of the Hartford Auto Parts Company, with a branch factory here, joining a large merger, believed to be the United Motors, which recently absorbed the New Departure Company, of Bristol. James M. Carney, an officer of the company, states that New York brokers are dickering for the purchase of the company. Whether the sale goes through or not, it will in no way affect the local branch of the company, Mr. Carney states.

At the Stanley Works inability to get steel is causing some trouble about turning out stock, but the company is doing a wonderful business, and the same is true at the Union Manufacturing Company. The North and Judd Manufacturing Company have a very sizable order from the United States Government for cavalry equipment, and business is rushing. So, also, is business at the Landers, Frary and Clark concern where the officials have seen fit to work out a plan whereby all employes are to receive a bonus. In line with these progressive movements, this concern recently adopted a pension system, and now have several aged employes on the list, as has the Stanley Rule and Level Company. The New Britain Machine Company is another local concern doing a thriving business, and the P. & F. Corbin division of the American Hardware Corporation is likewise booming. This concern has several sub-contracts on war orders, but, in addition, is doing a big business in its initial line—builders' hardware.—H. R. J.

HARTFORD, CONN.

JUNE 5, 1916.

The existence on the local stock market exchange of the greatest bull market ever seen in Hartford is one of a number of indications that this city is now being swept by a wave of prosperity such as it has never before experienced, and that the next few weeks may bring conditions that will break the remarkable records of even the first five months of 1916. Hartford's metal industries are largely, if not wholly, responsible for this prosperity, for they have brought here an influx of money estimated at between $50,000,000 and $75,000,000. The business rush comes through contracts with the European nations that are at war. Of these war orders, the largest individual amount has been received by the Colt's Patent Fire Arms Manufacturing Company, which is receiving approximately $35,000,000 for work done or under way. The Standard Machine Company, of which the Hartford Machine Screw Company is the chief subsidiary, showed profits last year of over $4,000,000 and it will make as much this year. In all, the war order business of the screw company is estimated at about $10,000,000. The Niles-Bement-Pond Company, of which the Pratt & Whitney Company, of this city, is a subsidiary, made 40 per cent. profits last year on a line of business that cannot be classed as war order work. The Pratt & Whitney Company is busy making arsenal machinery of various kinds.

Following a phenomenal jump in its stock quotations from 186 to 287½ points, the New Departure Company, of Bristol, Conn., most of whose stock was held by Hartford interests, has announced that it has gone into a $60,000,000 merger to be known as the United Motors Corporation. The other concerns in the merger are the Perlman Rim Corporation, of Jackson, Mich.; the Hyatt Roller Bearing Company, of Harrison, N. J.; the Delco Company, of Toledo, O., and the Reamy Company, of Indianapolis, Ind. During the time that the New Departure stock was being bought up, there was a wild scramble to get stock in Hartford and Bristol and small fortunes were made by those who held out for a high figure. In about a half month, the value of the stock jumped nearly 100 points.

After the announcement of the merger, dissatisfaction was expressed among the minority stockholders in Hartford, because they could not get for their stock anywhere near the amount which President DeWitt Page of the New Departure Company got for his, which is believed to have been about $450 a share. The minority stockholders have not yet accepted a bid of 275 for their interests.

The rush of orders is causing the Maxim Silencer Company to add 14,000 square feet of floor space to its plant, which will enable it to double its working force of 130 men. A two-story factory building, 110 by 64 feet is being erected adjacent to and connected with the building on Homestead avenue, where the company is now located. A garage, boiler house and covered passageway to a nearby building, which is to be used as the office, will also be built. The new $30,000 project will be completed by August 1, the demand for Maxim silencers and metal bayonet scabbards being so great as to make immediate expansion necessary.—T. C. W.

PROVIDENCE, R. I.

JUNE 5, 1916.

May, like a number of preceding months, has been a month of great activity among the metal trades, practically every plant in this city and vicinity being under operation to capacity with overtime schedules in many instances. How long these conditions will continue the concerns are unable to say, but new orders continue to come in, and the plants keep right along making the best of the situation. Even the most pessimistic, however, agrees that the summer season will not lack for business.

The manufacturing jewelry industry shows signs of improvement, according to a number of the manufacturers, and there are promising prospects for a satisfactory season. There is a distinct feeling of optimism among the manufacturers, and the belief holds that prosperity will come to them before the close

of the year. Not many of the jewelry plants are required to work overtime at present to fill the orders which have been received, but there seems to be sufficient work to keep things moving.

Two new factory plants are expected to be added to the list of those in the village of Auburn, in Cranston, within the next few months. At the recent meeting of the city council it was announced that the United Wire & Supply Company, with large factories in Providence and Pawtucket, had decided to accept the eight-year tax exemption offered by Cranston, and to locate its new factory in that city on land it has selected on Elmwood avenue. This concern manufactures gold, silver, copper, gold and silver-plated, seamless wire and tubing for jewelers' and general manufacturing purposes, its factory in Pawtucket being largely devoted to manufacturing metallic tubular parts for automobiles and similar purposes. It is proposed to erect a new plant at Auburn that will cost upwards of $200,000, and will accommodate the rapidly increasing business demands. Some months ago the stockholders voted to increase the capital stock of the corporation in order to provide for the new building.

Before the middle of June it is expected that the addition to the plant of the Standard Nut & Bolt Company at Valley Falls will be completed and in commission, and will be a source of great relief to the concern on account of the congestion at the works since the business commenced to increase to such an extent. A new engine is now being installed, and with the other equipment it is expected that the orders now being received can be filled more readily.

The Southern New England Railway Company has purchased from Allan J. Barber, of the Woonsocket Electro-Plating Company, about 8,000 square feet of land near the corner of Pond and Snow streets, Woonsocket. The land is occupied by the buildings used in the business of nickel plating, enameling and the manufacture of metal specialties. Mr. Barber retains ownership of the factory buildings, and the business will be continued for the present at the same location. Plans for a new factory are to be drawn in the near future, when arrangements will be made for the removal of the plant to a new location.

H. J. Astle & Company, 118 Orange street, this city, reports increasing activity in its business during the last few months. Among its latest contracts is one for furnishing the factory of the Mealy Manufacturing Company, of Baltimore, Md., with an electro-plating and polishing outfit, which, when completed, will be the largest in that section of the country. The concern has recently received several large orders from English concerns, among them being Hirst Bros. & Company, Ltd., of Oldham, England, consisting of polishing benches, dust collectors, sand-blast, blowers and drying machines of the Boland type. A coloring system for the Goldstein Jewelry Manufacturing Company, Toronto, and to D. R. Dingwall, Ltd., of Winnipeg, Canada, two pressure blowers, a polishing bench and a dust collecting system.

The co-partnership heretofore existing between Louis A. Brody and Charles Borenstein under the name of B. & G. Sheet Metal Company, 948 Westminster street, Providence, has been dissolved by mutual consent, Mr. Brody withdrawing, and the business will be continued by Mr. Borenstein.—W. H. M.

BUFFALO, N. Y.

JUNE 5, 1916.

Trade in this market has been strong and brisk during the past month. Every firm in this city has been working full capacity. Enough orders have been booked to keep them all busy during the next few months. Prices are said to be very much better than they were a month ago. Metal men, locally, anticipate that the prices on copper and other metals will not be lowered throughout the summer months, and as a result they are booking all orders with this conclusion in mind. The last month may be safely said to be 25 to 50 per cent ahead of April. In comparison with a year ago, it might be said that the volumn of trade in this market is fully 100 per cent ahead of last year, but when making this comparison it must be borne in mind that last year was far below normal.

While it is true that there has been no labor trouble in this city yet the owners of the various non-ferrous establishments are having a very difficult time in getting labor. Laborers are hard to get in spite of the fact that they are being paid extremely high wages.

All of the local foundries report that the local manufacturers are beginning to order more freely than they have during the other months of this year. The outlook for the summer months among the foundries is very good.

The National Bronze Company is making a number of strainers for several of the local brewing concerns in this city.

The Zero Valve and Brass Company report that they are doing considerable work for the Board of Water Department of New York City and they are working all of their forces overtime in order that they might catch up with their back orders.

"We are fairly swamped with work," said one of the local electroplaters and this is the exact sentiment of all of them. It has been quite a time since local electroplaters have been so overwhelmed with work, and it is not infrequently that orders are refused simply because they cannot care for the work. The local manufacturers and some from the towns which surround Buffalo are flooding the local platers with work.

The Washington Plating Company during the last month tripled the size of their plant and, at the time of this writing they are installing considerable new machinery, etc. Within the past month they booked a number of large orders which will keep them busy throughout the entire summer. Walter Hayes, one of the owners of the company, is superintending the alterations, etc.

The following new corporations filed their certificates:

General Castings Corporation. Capital $5,000. Various kinds of castings. Incorporators: William H. Means, B. S. Linetty and E. L. Stutt.

Roberts Iron and Metal Works, Inc. Capital $50,000. Ornamental metal work. Incorporators: Henry Weigen, Richard H. Templeton, and Frederick G. Grotz.—G. W. G.

ROCHESTER, N. Y.

JUNE 5, 1916.

Trade conditions in this market during the last month are way ahead of those of a year ago. Local metal tradesmen are having brisk trade. Enough orders have been booked to keep their establishments busy throughout the summer months Prices are said to be satisfactory. Considerable of the work is for local manufacturers. The only thing which has been a bit unsatisfactory in May was the labor question. There has been considerable trouble, and just when they needed them most, as a number of the local establishments have been rushed with orders. The silver platers have struck for shorter hours and higher wages. They demand a minimum wage of 37½ cents an hour and an eight hour day. The men are now getting 32¾ cents an hour and are working ten hours on week days and five hours on Saturdays.

The Flower City foundry owners met on May 15 at the Powers Hotel and took the first steps toward the forming of a permanent organization in the trade. A committee was appointed, consisting of one representative from each foundry to formulate a constitution for the organization whose purpose will be to create harmony in the trade for mutual protection, and to uphold the high standard of output for which the local foundrymen are known. All foundries in the city will be invited to join the association which may develop into a buying unit of wide scope.

Representatives from the following concerns were present: Gleason Works, American Laundry Machinery Company, Erie Foundry Company, Willsea Works, Crescent Foundry Company, Galusha Stove Company, Enterprise Foundry Company, Judson Governer Company, F. L. Heughes & Company, Progressive Foundry Company, Josiah Austic & Company, and the Northwestern Aluminum and Bronze Company.

Secretary Roland B. Woodward of the Rochester Chamber of Commerce has received several notices from Washington advising him to notify all local concerns, that should they do any exporting that great care should be exercised in packing. Secretary Woodward has been doing some very systematic educating ever since he received the notices.

Two new concerns were incorporated during the last month. They are: Bastian Brothers' Company, capitalized at $50,000, to manufacture jewelry, emblems and badges. The incorporators are: William B. Remington and Walter S. Robertson. The other concern is the Popp Foundry Company which is

capitalized at $10,000, to making castings from all kinds of metals. The incorporators are: Charles Popp, George T. Hoffman, and Charles Stewart.—G. W. G.

NIAGARA FALLS, N. Y.

JUNE 5, 916.

Throughout the last month there was a steady increase in trade and a decided increase in volume of business over that of April. Inquiries are being made more frequently. Prices are considered good and a good many of the orders call for rush delivery. Everyone who has been putting off things to the last now wants everything in a hurry. A number of blanket contracts have been booked within the last four weeks, and judging from the present spell of prosperity, the local men believe that the summer months will be exceedingly good.

Labor has been very scarce during the last few weeks and then coupled with this several of the local concerns have been troubled with strikes. The labor element has reached a stage of cock-suredness, although the metal men have been paying very high wages.

At the 29th general meeting of the American Electro-Chemical Society at Washington, D. C., Niagara Falls was well represented. I. R. Edmands, consulting engineer of the Union Carbide Company, read a paper on power development. A. H. Hooker, technical director of the Hooker Electro-Chemical Company, read a paper on the chemical industries. F. J. Tone, department manager of the Carborundum Company, spoke on electric furnace products, and W. S. Landis, a well-known local chemist, spoke on the nitrogen industry.

The Titanium Alloy Manufacturing Company, who report business as being good and the prospects of the future as encouraging, announce that they will break ground very shortly for the construction of a new machine shop. This new shop will be 50 x 100 feet, two stories high and made of reinforced concrete, and will be used for the machining and finishing of dies, sand castings, etc. It will be equipped with the regular machine shop tools. In addition to these they have decided to add a drop forge hammer for aluminum bronze forgings. They only expect to go into this field to a limited extent. At present they are pushing hard their aluminum bronze casting department.

Operations have been started on the plant of the Canada Smelting Company, of Niagara Falls, Ont., which is located at Slater's Point. The plant will be given over exclusively to the smelting and refining of nickel. The plant is to cost in the neighborhood of $100,000. The company's headquarters will be moved from North Bay, Ont., to this city as soon as the plant is finished.

The Aluminum Company of America have just awarded contracts for the construction of two large additions to their local plant. One of the buildings, which will be made of reinforced concrete, will be 94 x 45 feet and six stories high, with an "L" shaped wing 23 x 31 feet. The other, which will also be made of concrete, will be 120 x 40 feet and two stories high.

The Niagara Alkali Company is doubling the size of their present plant. They are making three additions to their present structures and constructing six new buildings which will adjoin them. Two of the six buildings will be 200 x 50 feet, one 150 x 75 feet and one 75 x 45 feet. These four will each be one story high and will also have a basement. The fifth building will be 250 x 80 feet, partly two stories high and the remainder one story, with basement. The sixth building will be 25 x 70 feet, one story high. Of the three additions one will be 60 x 75 feet, one 55 x 40 feet and one 35 x 50 feet, and all will be two stories high. Both additions and new buildings will be of concrete construction with brick curtain walls. These additions are being made so that they may increase their capacity of output in caustic soda, potash, liquid chlorine and bleaching powder.

The Hooker Electro-Chemical Company is making a million dollar addition to their present plant. It will consist of five new concrete, steel, brick structures.

The Niagara Smelting Company, a new company in this city, is building a number of electric furnaces on the north side of the city. They expect to have the plant ready for operation by July 1. It has been said that they will smelt and refine aluminum.—G. W. G.

COLUMBUS, O.

JUNE 5, 1916.

The metal market in Columbus and central Ohio has been active and firm during the past month. Prices have been well maintained at previous levels and all exchanges have been towards higher levels. The volume of business is gradually increasing along all lines. The tone of the market is good and prospects for the summer business are said to be excellent. In fact, metal dealers are of the opinion that the demand for all varieties will continue good throughout the season, and preparations have been made to secure adequate stocks to take care of the expected business.

Supply now seems to be up to the demand, although no accumulated stocks are reported. Shipments have been delayed to a certain extent by the growing car shortage.

Copper is firm and the volume is quite large. Crucible shape is selling at 27½ to 27¾ cents to the trade. Red brass scrap is selling around 20½ cents, while yellow brass is quoted at 15¾ to 16 cents. Aluminum is firm, and prices are strong around 50 cents for No. 1 stock. Tin is firm also, and prices range from 49 to 50 cents. Zinc is firmer and the weakness of several weeks ago is now gradually passing away. Prices to the trade range around 15¾ cents. Babbitt is moving fairly well, and type metals of all kinds are in very good demand.

The Diamond Metal Stamping Company, of Columbus, Ohio, has decreased its capital from $50,000 to $25,000.—J. W. L.

CINCINNATI, O.

JUNE 5, 1916.

What, for a time, threatened to be a really serious handicap to the most important local branch of the metal trades, the machine-tool industry, turned out very shortly to amount to very little. This was the threatened general strike of machinists, an elaborate publicity campaign on the part of the union leaders, however, being the largest part of the matter, judging from subsequent developments. Unless certain unreasonable demands were granted, the union organizers declared that they could close every shop in the city. The employers, almost to a man, replied promptly that they could not possibly grant the demands made, and that, obviously, constituted in effect a call for a show-down. When the pinch came, scarcely enough men left any plant to cause serious trouble, and most of those who walked out returned to work a few days later, after considering the matter. In short, the strike, in so far as any effect on the trade as a whole in Cincinnati was concerned, was a complete failure, and this was soon realized by the men and their leaders, with the result that still more of the strikers returned to work, effectually breaking the back of the trouble. The fact that the larger employers stood together as a unit against granting the demands made upon them was undoubtedly responsible for the almost ridiculous failure of the walk-out, and the labor situation has in consequence cleared up to a point where no further trouble is likely to develop.

Activity in the machine-shops continues at a high level, and the foundries supplying them have, in their turn, had all that they can do. Metals are in ample supply, although prices are such that a tendency is noticeably to buy only for immediate requirements, the feeling being that a drop rather than a further advance may be looked for in the future. Ordinary industrial requirements, as distinguished from the demand growing out of war orders, are steadily increasing, making the total volume of business handled extremely good.

A direct result of the rush of business handled by nearly all lines of industry, and especially by metal-working plants, has been a considerable increase in the number of injuries received by workmen, according to Victor T. Noonan, director of safety for the Ohio Industrial Commission. "Rush" has been substituted for "Safety first" as a plant motto in many cases, Mr. Noonan declared, and an increase in injuries was the inevitable

result. The considerable number of inexperienced men taken on has also contributed to the number of injuries.

The Republic Stamping & Enameling Company, of Canton, O., has announced a general wage increase of 10 per cent. in its plants, affecting 1,000 employes, and applying both to day work and piece work. The Dayton Spinning & Novelty Company, of Dayton, O., of which William D. Reeder is president and secretary, F. Kinninger treasurer, and H. Pearson manager, reports an active business, in spite of the short time it has been in business. The company manufactures novelties in copper, brass, silver, tin and other metals.

Dayton members of the American Electro-Plating Society have elected the following officers and delegates to the National Convention: President, Walter Fraine; vice-president, Robert Suman; secretary-treasurer, A. Lamoureaux; delegates, Walter Fraine, Hartzell and Lamoureaux. K. C. C.

LOUISVILLE, KY.

JUNE 5, 1916.

The Louisville brass and copper workers report that the summer of 1916 will be the busiest period the trade has known in many years. A number of the shops now have contracts which will keep them going for months, and are refusing delivery on any additional new work before September or October. Several of the houses have taken in so much large distillery work that they are letting sub-contracts on part of the casting, preferring to do mostly the sheet metal work. In addition to the large distillery business the machine shops, automobile manufacturers, farm implement manufacturers, and in fact all classes of the manufacturing trade, are requiring a great number of castings of one kind or another. There is a general scarcity of trained mechanics in the city, and good men apparently are not to be obtained, with the result that the shops are now working holidays and Sundays, and until 9 o'clock or later every evening.

While the copper market is high, and probably destined to go higher, deliveries are more certain now, and in some cases are being made in fairly good time. Sheet copper is being delivered in four to six weeks, while tubes are somewhat slower, and require three to four months. Prices from a base quotation are about as follows: Ingot, 33@34 cents per pound; sheet, 39 cents; tubes, 40@42 cents.

Matt Corcoran, Jr., of Matt Corcoran & Company, reports that the company is keeping busy, and that the showing this season has been way ahead of that of last year. Mr. Corcoran is of the opinion that business will continue throughout the entire year upon the same plane as that shown during the first five months, and that a new record will be established among the local coppersmiths.

An extra heat is being worked out every evening at the plant of the Independent Brass Works at this time. J. W. Rademaker, manager of the company, reports that the force has been increased form three to six, and a new coremaker and moulder put to work. The company is doing a lot of special casting for other copper-working concerns, which are crowded with sheet metal work. Some pattern work from large manufacturing concerns is also being turned out.

The Standard Sanitary Manufacturing Company invited the members of the Kentucky Master Plumbers' Association to be its guests at the Ahrens & Ott plant at Louisville for one entire day during the recent state convention in Louisville. The members and their friends were shown over the entire plant, where they saw brass goods molded and poured, in many cases for the first time. Bath-tub enameling and manufacturing also was of great interest. Refreshments were served on the grounds, and a big banquet in the middle of the day.—G. D. C.

DETROIT, MICH.

JUNE 5, 1916.

Brass, copper and aluminum manufacturers for the last several weeks have experienced exasperating difficulty from lack of available transportation facilities. This is an unusual situation at this time of the year, and attributed to one real cause—the European war, which is blamed for about everything that goes wrong, owing to the fact that munition and automobile manufacturers are flooding the railroads with freight. Some relief seems to be in sight since navigation is now opening, the first boats working their way through the ice this week, making a clear stretch from Buffalo to Duluth. The Detroit docks are jammed to suffocation with freight made up largely of automobiles and munition products, destined for lower lake ports, where they will be transshipped to the seaboard by the rail lines. So great is the press of freight that boats not yet in commission are being loaded with products ready to be transported as soon as sailings are ordered.

The second feature—lack of help—seems to have no relief in sight; automobile, brass, copper and aluminum manufacturers at present are scouring the country for skilled mechanics, but are unable to find sufficient to fill the needs of pressing work. Plants are working night and day, order conditions in this line being the best known in the history of the middle west.

It is reported that another lamp company merger, similar to that recently mentioned in Detroit, including the Edmonds & Jones Manufacturing Company, Detroit; Canadian Lamp & Stamping Company, Ford City, Ont., and the Chicago Electric Manufacturing Company is contemplated in Cincinnati, Ohio, whereby the Corcoran Lamp Company, the Victor Lamp Company and the Victor Auto Parts Company will be united into a $2,000,000 corporation.

Barney Nehls, who for many years has operated a plating works at 248 Brush street this city, reports his establishment working to its greatest capacity, with heavy orders from automobile companies and accessory manufacturing concerns. He has recently added largely to his equipment owing to the press of business.

The Detroit Ball Valve Company, at 572 Franklin street, has been so pressed with orders from New York and Chicago that it has been forced to work over-time for a long while. The plant has recently been equipped with new machinery, and has prospects for work extending well into next fall.

All the automobile plants together with accessory and brass, copper and aluminum concerns, are working way beyond their capacity in an effort to catch up with orders. These lines all report the greatest run of business in their history, and see no prospects of a let-up in the near future.

Employees of the Michigan Copper & Brass Company struck for a wage increase two weeks ago. The strike continued for one week, and in the meantime the plant was not operated to full capacity. However, at the end of one week, differences were adjusted and the strikers resumed work. The company was not seriously handicapped, and is now operating to its fullest capacity.—F. J. H.

TRENTON, N. J.

JUNE 5, 1916.

The unrest of labor and the call of the munition plants for help frequently gives the manufacturers in the metal lines uneasiness and labor troubles. The fact that everybody who wants a job is working encourages strikes, and skilled hands become independent. One hundred and fifty young men, employed at the J. L. Mott plant in assembling time fuses, went on strike after the company turned down their demands for an increase in pay on the piece work system. The young men, it is said, earned good wages, but thought a strike would get them better results. They quit and remained out a few days. The company was handicapped in securing others to take their places, but refused to give in. Finally the Mott Company announced that it would allow the men to quit for the day when they had no material to work on and return the following day. By this plan they can work hard the following day and earn as much as they did formerly in one day. The arrangement was satisfactory and the strikers returned to work. Previous to that strike, twenty-five men employed in the packing department went on strike for more pay. They are paid by the day. Their demands were granted. The Mott Company has experienced many strikes since it began the manufacture of munitions. The munition workers feel that they will lose their positions when the contracts are completed and are trying to earn all they can regardless of being "blacklisted" in the future.

The Mercer Automobile Company is substituting aluminum bodies for its cars in place of wood. They find it makes the cars considerably lighter and easier to repair in case of acci-

dent. The company is very busy at the present time and expects a busy summer. The Buckthorn plant of the John A. Roebling's Sons Company is operating full handed again after experiencing a strike. The Roebling company is lessening dangers of future fires employing more watchmen.

The Skillman Hardware Manufacturing Company is rushed with orders, and General Manager Wherry says he expects a very busy summer. No labor trouble is experienced at this plant, and the employes appear to be well satisfied with the wages and working conditions. The Bechtel Engraving Company finds business much better with a demand for more copper goods.

The Billingham Brass and Machine Company is having trouble trying to get experienced help in all departments. Philip Billingham, president of the concern, said to a representative of THE METAL INDUSTRY: "We are rushed with work and are greatly handicapped in getting sufficient help to turn out the orders. We need all the help we can get, and even advertisements in the newspapers fail to get us the desired skilled hands. The outlook for the summer is very good and we expect to be very busy. Our orders are important ones and must be turned out on time."

The McFarland Foundry and Machine Company reports business pretty good. When asked what the prospects were for the coming summer months, General Manager Staples said that he could not forecast at this time. He said, however, that he believed business would be good during the warm weather.

The National Electric Plating Company, Bechtel Engraving Company and Clifford Novelty Works report business fair, with the same prospects for the summer. The Trenton Smelting and Refining Company is very busy at both its plants.—C. A. L.

NEWARK, N. J.

JUNE 5, 1916.

An almost universal cry among manufacturers here that they cannot secure enough competent help to get out their orders is an indication of business conditions in this section at the present time. While business cannot be called booming it is very good, many manufacturers reporting that it is the best it has been for a number of years at this season of the year. A year ago things were moving briskly in factories making war munitions, but other lines were languishing. There were just beginning to be indications of a change for the better, and some manufacturers optimistically foretold better times when fall came, but the manufacturers were passing through a hard time, many of them running behind each month. But now the factories are all busy, and nearly every one who wants work can secure it—certainly every person who is at all capable. Wages, too, are generally much better than a year ago. Yet in a way, the manufacturers are nearly as perplexed as a year ago, but it is not because they are not paying expenses, but rather through the difficulty of getting enough materials to keep their plants running. What they do get they have to pay several times as much for as a year ago, and this means that to cover themselves, they have had to raise the prices of their goods to the consumers. Many manufacturers report that if they could get all the materials they want and more help they could get a great deal more business. It is the great demand for brass, spelter and other metals and chemicals for war purposes that has caused manufacturers of metal goods for regular trade channels to be handicapped by the lack of materials and made them pay exorbitant prices for such supplies as they do obtain.

One of the features of the metal business the last month has been the big demand for silver goods. Local manufacturers of silver goods state that the rapid jumps in the price of silver have carried it higher than it has been for years, but the apparent size of the jump is greater than the real increase, as large as that has been, because of the fact that for a couple of years the price of silver was below normal, and the first of the recent increases simply brought the price back toward normal. Manufacturing silversmiths report that business is very brisk at the present time, some of them being behind in their orders. Part of this increased business is said to be due to the increased demand by the public for silver goods, and part to the fact that the retail dealer, knowing that the price of silver has been jumping up so fast that they could not be sure one day what prices would be the next day, have been laying in a heavier supply than usual, while prices are somewhat favorable. As an outcome of this, heavier buying there has been still heavier sales, for having a large stock of silverware on hand, the dealers have put it on display and prospective customers, seeing such stocks of silverware think it is in vogue and buy silverware where they had perhaps planned for something else.

During the month of May Newark has been celebrating the 250th anniversary of the founding of the city. The celebration began on May 1 and will continue through October. On May 13 Secretary of War Baker, as the personal representative of President Wilson, formally opened the big industrial exhibit in the First Regiment Armory, which is one of the celebration events. This exposition continued for three weeks, and was one of the biggest events of its kind held in the East for a long time. Visitors were present from many parts of the world, as far away as Greece and Australia. One of the features of the exhibit was the display by the manufacturing jewelers of Newark which was located in the Tower of Jewels, in the center of the armory. The upper part of this tower served as a band stand, from which concerts were given several times a day. The jewelry display was valued at many thousands of dollars and comprised principally fourteen and eighteen karat gold jewelry, platinum jewelry, rings, mesh bags and toilet sets. The exhibitors and the lines displayed by them were as follows:

Durand & Company, mixed gold and platinum mesh bags, brooches and lorgnettes; Riker Brothers, platinum jewelry set with diamonds, pearls, sapphires and other stones; Jones & Woodland, gold and platinum rings; Larter & Sons, an exhibit of gold and platinum jewelry and rings; Carter, Gough & Company, a display of 14-karat gold jewelry and platinum jewelry, lorgnettes, knives, chains, cigar cutters, etc.; Allsopp & Allsopp, had an exhibit of gold and platinum jewelry. As a part of their exhibit they had a piece of pure gold and one of pure platinum; Krementz & Company, a display of 14-karat and platinum jewelry and novelties; William B. Kerr & Company, toilet goods finished in gold and French enamel of period decoration.

Most of the gold goods displayed by the above-mentioned firms were of the white and green gold, which are so popular at the present time.

In addition to the jewelry exhibit other metal lines were on display. The display of the Art Metal Company, consisting of bronze and other fancy metal goods of great variety, was an attractive one. The Whitehead & Hoag Company had a large exhibit of medals, paper knives, badges, etc. J. Wiss & Sons Company had an exhibit of cutlery and small tools; H. J. and F. S. Benson, brass workers, of Glenridge; the Central Stamping Company, of Newark; Driver-Harris Wire Company, of Harrison, N. J.; the Manufacturers' Can Company, and the C. T. Williamson Wire Novelty Company, of Newark, were among the other exhibitors.

Among the tool and machinery exhibits were those of Sloan & Chace, makers of precision machinery; Gould & Eberhardt, A. J. Hastings & Co., the F. W. Horstman Co., of Irvington; Ludlow & Squier, New Jersey Machinery Exchange. The electrical concerns exhibiting were the Crocker-Wheeler Company, the I. R. Nelson Electric Repairing and Manufacturing Company, the Splitdorf Electrical Company, and the Westinghouse Electric & Manufacturing Company.

The firm of Simpson & Harrison, enamelers, which was organized about six months ago and opened a shop at 105 Oliver street, has gone out of business. William Simpson, one of the partners, has gone back to his old position with Carter, Gough & Company, and the other, T. Fred Harrison, is now foreman of the enameling room of the Whitehead & Hoag Company.

During the past month there has been held in the Free Public Library under the auspices of the Newark Museum Association an exhibit of bronzes made by A. Griffoul & Brothers Company, bronze casters of this city. This firm is said to be the only one in the United States that still uses French clay for casting. Auguste Griffoul was for many years associated with the famous founder, Baididian, before the three brothers comprising the firm emigrated to this country.

The North American Copper Company has purchased a factory site on the Hackensack river near here. It is stated that this company will manufacture metal products for export.

On June 1 the C. A. C. Silver Company, moved from 109 Oliver street, to First street, near the Orange line. John S. Williams, who has also been located at 109 Oliver street, moved at the same time to 190 McWhorter street.—R. B. M.

NEWS OF THE METAL INDUSTRY GATHERED FROM SCATTERED SOURCES

The North & Judd Manufacturing Company, New Britain, Conn., is contemplating an addition to its power plant.

The Goldschmidt Thermit Company, New York, N. Y., has moved its general offices from 90 West street to the Equitable Building, 120 Broadway.

The New Departure Manufacturing Company, Bristol, Conn., has bought seventeen acres of land to be used for the building of individual, low-priced cottages for workmen.

Plans have been filed for a one-story addition to the building of the Manhattan Brass Company to cost $7,500. It will have a frontage of 20 feet and a depth of 99 feet and will be of fireproof construction.

The Lemoyne Brass Foundry, Lemoyne, Pa., is constructing an up-to-date plant at a cost of $7,000. The building is 100 feet long, 70 feet wide and one story high. The company operates a brass, bronze and aluminum foundry.

The Bristol Brass Company, Bristol, Conn., have plans for the construction of an additional factory, 60x300 feet, which will be used mostly for a brass casting shop, and not for its brass tube and rod business, as was reported.

Arthur D. Little, Inc., chemists and engineers of Boston, Mass., announce that the Dominion of Canada has granted a charter to Arthur D. Little, Ltd., as a corporation for the purpose of the study and development of Canadian resources.

The Star Plating Works, Buffalo, N. Y., will erect a two-story factory at 102 Broadway to be used for plating purposes. The company operates, besides a plating department, a grinding room, and polishing, japanning and lacquering departments.

Arthur A. Fogg, 45 Pratt street, Meriden, Conn., who for many years has furnished molds and done die sinking, chasing, designing and molding for the New England trade, announces that he is in a position to handle orders for similar work from any section of the country.

The Terry Steam Turbine ompany, builders of steam turbines for all purposes, Hartford, Conn., announce the appointment of O. E. Thomas, 626 Washington Building, Los Angeles, Cal., as district sales manager for the territory covering Arizona and the southern portion of California and Nevada.

The annual report of the Westinghouse Electric & Manufacturing Company for the year ended March 31, 1916, shows gross earnings of $50,269,239 and net manufacturing profit of $9,429,895. The net income available for dividend after the inclusion of interest and discounts and the payment of fixed charges was $9,666,788.

The P. Pryibil Machine Company, Inc., 512-514 West 41st street, New York, announce that they have purchased the entire spinning lathe business of the Wilcor Manufacturing Company, Chicago, successors to Fritz A. Schulz. Pryibil lathes and accessories has always been the standard, and is still in greatest demand, but customers who prefer the Schulz lathe can hereafter obtain it from the Pryibil works.

The Parker Rust Proof Company of America, 864 Woodward avenue, Detroit, Mich., will erect a two-story fireproof building, 100x150 feet, on the site which it recently purchased on York street. The company advises that the only equipment that they will require includes motors, compressors and gas producers. Similar equipment will also be required later for companies operating under licenses granted to them by the Detroit company.

The Baltimore Copper Smelting and Rolling Company, Canton, Md., operating a smelting and refining plant, brass foundry, tool and grinding room, rolling mill and tinning and polishing dpartments, has cut its work day from ten to eight hours, which means an increase in pay for the employees. This company states that they are not planning the construction of a brass mill as was reported, but that they have been rolling brass in their copper mill for some months past.

Wm. O. & E. R. Sheldon, 253 Broadway, New York, who deal in brass, copper, spelter, lead, die castings, etc., announce that they have been made Eastern representatives for the New Era Manufacturing Company, Kalamazoo, Mich., and are in a position to furnish Metallic Phosphoro for use in place of phosphor tin in the manufacture of phosphor bronze and similar mixtures. They will also handle the New Era phosphor bronze for journal bearings and aluminated zinc and aluminated nickel.

The Metals Production Equipment Company, successor to the Quigley Furnace & Foundry Company, 105 West Fortieth street, New York, has opened an office in the First National Bank building, Chicago, with E. E. Adams in charge, for the purpose of serving its customers in the Middle West to better advantage. At present the company has four classes of product, nameley, accurate temperature heat-treating and forging furnaces for oil, coal and gas fuel; powdered coal equipment; brass rolling-mill products and gray-iron castings.

T. McAvity & Sons, Limited, St. John, N. B., is in the market for lathes for making 8-inch shells, from 16 to 18 inches single purpose, and from 24 to 36-inch standard lathes for roughing, finishing, boring, etc.; 35 to 40 drills, banding, presses, wave ribbing, tapping, recessing, etc., including complete tool room equipment. The company operates a brass, bronze and aluminum foundry, brass machine shop, tool and grinding room, casting shop, cutting-up shop, stamping, tinning, brazing, soldering, plating, polishing, japanning and lacquering departments.

Columbia University, New York City, announce a summer session, July 5 to August 15, 1916, at which time courses will be given as follows: Gems and gem minerals, by Professor A. J. Moses; assaying, by Professor E. J. Hall, and also the regular courses in assaying for mining, metallurgical and chemical engineers. These courses should be of suitable interest to anyone interested in the manufacture of jewelry, as they cover the recovery values from plating and picking solutions and their assay and the assay of platinum alloys.

The North American Copper Company, 52 Vanderbilt avenue, New York, has bought a large tract of land on the Newark, N. J., meadows. The property embraces over ten acres and has a frontage of six hundred feet on the Hackensack river, extending back to Hackensack avenue. It is a short distance from the tract recently purchased by the Ford Motor Company. Plans for the improvement of the property are now being prepared and the company will manufacture a great deal of its metal products intended for export.

The Morris Manufacturing Company, Springfield, Mass., recently incorporated with $250,000 capital stock, plans to construct a plant for the manufacture of die-casting machines. The company states that they have orders enough on hand to keep them busy for a year and that they can handle brass and aluminum as well as the ordinary die-casting alloys. They are at the present time filling large orders for the British Government. The company operates a brass, bronze and aluminum foundry and also a tool room.

Joseph E. Vincent, Jr., for a number of years connected with Wheelock, Lovejoy & Company and also the Swedish Iron & Steel Corporation, announces that he has organized a new company, The Iron, Steel, Metal and Alloy Company of America with office in the Liberty Tower building, New York. Mr. Vincent, who is general manager of the new company, states that the object is to do a general commission or brokerage business in the buying and selling of metals, alloys, iron and steel of all descriptions, including all the ordinary metals and babbitt, bismuth, cadmium, chrome, nickel, tungsten, vanadium, manganese, and so forth.

The Court of Appeals has handed down a decision sustaining the lower courts in dismissing an indictment against the International Nickel Company, charging the maintenance of a public nuisance in the operation of its metal working plant at Bayonne, N. J. It was alleged that fumes, gases, odors and smoke were emitted in the process of refining, and contaminated the air at New Brighton and other parts of Richmond county where the indictment was found. The company contended its plant was operated without any malicious or unlawful intent or purpose, and that as it is a New Jersey corporation, outside the state of New York, there was no jurisdiction to indict.

S. E. Bramer, of the Copper Clad Steel Company, with main offices at Pittsburgh, Pa., and works at Rankin, Pa., and which was incorporated last September with a capital of $250,000 by J. Roth, S. F. Loeb, F. R. S. Kaplan, Esq., William Smith, S. K. Frank and S. E. Bramer for the purpose of manufacturing welded copper clad steel, states for the company that Mr. Roth has been working on the process employed for the last eight years and claims that they are the first people that have been able to unite copper with steel without an alloy. The process, Mr. Bramer also states, gives an absolute weld without voids throughout the entire length of the coil, that the conductivity is uniform throughout, which is a very important feature for electrical purposes, and that the material has a much greater strength than hard drawn copper.

The Leyshon and Lane Company, Inc., has recently been organized to take over the oven and special foundry equipment business which has grown out of H. M. Lane's foundry research work. The new company has been organized to contract for complete foundry installations, to install melting furnaces, annealing ovens, core ovens, mold ovens, and handling appliances. T. A. Leyshon, who has been associated with Mr. Lane for several years, is president of the new organization; and C. T. Holcroft, who has been in the furnace building business for many years, first in Chester, Pa., district, in the Pittsburgh district and later in Detroit, is treasurer. The new company has made arrangements for a portion of Mr. Lane's time so that he can act as consulting engineer on any problems they may have. The H. M. Lane Company will continue as a consulting organization under the personal charge of H. M. Lane. The organization of the new company will free Mr. Lane of direct responsibility for the oven business and give him more time for consulting practice.

INCORPORATIONS

Business organizations incorporated recently. In addressing them it is advisable to include also the names of the incorporators and their residence. Particulars of additional incorporations may frequently be found in the "Trade News" columns.

To do lithographing on metals.—The Edgar Metal Decorating Company, Walden, N. Y. Capital, $50,000. Incorporators: Thomas S. Edgar, Harry C. Lomb and Richard Condon.

To manufacture copper, brass, silver, iron and steel products.—Murcott Duden Company, Brooklyn, N. Y. Capital, $25,000. Incorporators: Joseph Murcott, Conrad Jaeger and Emily S. Wamdlett.

To operate a foundry and machine shop.—Standard Brass and Aluminum Foundry Company, Syracuse, N. Y. Capital, $5,000. Incorporators: Ivar F. Worme, Patrick Sullivan and Conrad Schoeneck.

To manufacture gold and silver articles.—King-Clark Manufacturing Company, Newark, N. J. Capital, $10,000. Incorporators: Thomas A. King, Frederick H. Clark and Henry Carless, Newark, N. J.

To manufacture gold and silver novelties.—King Cigarette Case Company, Newark, N. J. Capital, $20,000. Incorporators: Thomas A. King, Newark; Elmer E. Froman and Thomas A. Walsh, New York City.

To do general plating business.—The U. S. Electro Lead Plating Company, of Cleveland, Ohio. Capital, $10,000. Incorporators: John Howorth, Ada J. Howorth, Albert Woodall, John E. Schmotzer and John L. Foster.

To manufacture furnaces, oil, gas and electrical appliances.—Quigley Furnace Specialties Company, New York, N. Y. Capital, $100,000. Incorporators: W. S. Quigley, Edward Powers, George W. Vause and Lewis N. Vause.

To manufacture switch boxes and cabinets and do small stamping work.—The Holl Stamping and Manufacturing Company, Cleveland, Ohio. Capital, $20,000. Incorporator, O. D. Eshelman. A stamping and japanning department will be operated by this company.

To manufacture brass, aluminum and steel.—The Peerless Brass Foundry and Machinery Company, South Bend, Ind. Incorporators: Jay H. Woodward, Anthony M. Fortenbacher and Robert F. Miller. The officers are: J. A. Wilskey, president and general manager; R. F. Miller, vice-president, and J. H. Woodward, secretary and treasurer. The company will operate a brass, bronze and aluminum foundry and also a brass machine shop.

INCREASE IN CAPITAL STOCK

The De Vilbiss Manufacturing Company, manufacturers of the Aeron system of air compressors, has increased its capital stock from $300,000 to $600,000, and plans to erect a new plant on a site recently acquired near the Lake Shore Railroad in West Toledo.

At the time of the taking over by the Stamford Rolling Mills Company, Stamford, Conn., of the plant of the American Cupro Nickel Company, as mentioned in the May issue of THE METAL INDUSTRY, the stock of the Stamford Rolling Mills Company was increased to $335,000 preferred and $2,000,000 common.

The Dings Electro-Magnetic Separator Company, 671 Smith street, Milwaukee, Wis., has increased its capital stock from $10,000 to $100,000, and changed its name to the Dings Magnetic Separator Company. Mr. Dings, who founded the business and brought it to its present state of success, has sold his controlling interest to the new management, and will sever his connections with the company. R. A. Manegold will succeed Mr. Dings as president and general manager.

INQUIRIES AND OPPORTUNITIES

Under the directory of "Trade Wants" (published each month in the rear advertising pages), will be found a number of inquiries and opportunities which, if followed up, are a means of securing business. Our "Trade Want Directory" fills wants of all kinds, assists in the buying and selling of metals, machinery, foundry and platers' supplies, procures positions and secures capable assistants. See Want Ad. pages.

PRINTED MATTER

Cleaning Compounds.—The Munning-Loeb Company, Matawan, N. J., have issued a little booklet giving a description and recital of the advantages of their No. 6 cleaning compound. Full directions are given for the proper use of this material and the booklet may be had upon request.

Heat Insulation.—Nonpareil high pressure covering for high pressure and superheated steam lines, boilers, etc., is described in a new eighty-five page board covered catalog just issued by the Armstrong Cork & Insulation Company, Pittsburgh, Pa. Copies of this booklet will be sent upon request to any one interested.

CATALOG EXHIBIT

An exhibition of every kind of catalog may be seen at The Metal Industry office, 99 John street, New York. The Metal Industry is prepared to do all of the work necessary for the making of catalogs, pamphlets, circulars and other printed matter. Estimates will be furnished for writing descriptions, making engravings, printing, binding, for the entire job from beginning to end or any part of it.

METAL MARKET REVIEW

New York, June 5, 1916.

COPPER.

The month of April was the biggest copper buying month that the trade had ever known and the month of May was about one of the smallest. Buying movements cannot keep on forever. The English and French Governments bought and consumers bought heavily. Consumers acted and the large producers talked as though the buying was never going to end. The "talk" was that there would not be enough copper to go around, etc., and then of course the easily gulled consumers bought more and today they have copper to burn—they are trying to sell it—but they all have it and as new consumers do not come into existence every day, there is quite a surplus of copper on the market that has yet to be digested. It is just as well to remember always and never forget that the more copper goes into consumption, the more copper there is on the market for sale. Copper always comes back and is always copper. The buying of copper has been overdone and it looks like the "enormous foreign buying" business has been over "talked." There is nothing to show for it but the "talk." The exports should show the large export business but they don't. The total exports for May will be about 15-16,000 tons or say 32,000,000 pounds and this a good deal less than any monthly average for a good many years.

Prices have declined during the month about 2 cents per pound on free offerings from dealers, speculators and consumers and there are sellers today for any deliveries this year, not only in carload lots but in lots of 500 tons and more and no one seems to be interested.

Electrolytic is offered today at 28¾ prompt to close to 27 cents for last quarter delivery. The large producers are supposed to be asking 29 cents for last quarter.

Lake copper is easier and very dull and Castings copper is offered at 26 cents for any delivery this year.

TIN.

The tin market shows a decline for the month of about 5½ cents a pound; from 51½ at the opening to 46 cents at the close. Consumption has been large and is estimated at over 5,000 tons. Prices at the close are 5 tons spot and June at 45¾ cents, future months 5 to 10 points lower.

LEAD.

The trust price has been held steady at 7½ cents New York basis, the outside market has been rather easier and there are sellers today among the independents at 7¼ to 7.30 New York delivery. Market has been dull, very little demand.

Later. The trust has reduced the price to 7 cents.

SPELTER.

The price of spelter continues to decline and from 17¾ at the opening of May for prompt spelter, there are sellers today 15 to 15¼ with last quarter shipments offered at around 12 cents. The market has been very dull and the business during the month does not in any way square up to the supposed heavy copper and brass business.

ANTIMONY.

Prices of antimony have declined the same as all other metals and from 38 cents at the opening of the month, there are sellers today at close to 25 cents. There was a little reaction about the middle of the month and prices advanced for a day or two, but the advance did not hold and prices rapidly sagged off again.

ALUMINUM.

The aluminum prices have held wonderfully steady. Carload lots of No. 1. virgin aluminum have sold in New York from 59½ to 60½ and 61 cents and the pure remelt 98-99, is quoted at 57½ to 58 cents in carload lots. No. 12 remelt is offered around 54 cents but the demand is not very active. Sheets for prompt delivery are difficult to obtain and command more or less fancy prices.

SILVER.

The silver market has been quite active, opening at 72⅞ New York. Prices advanced to 76⅞ and then declined to 71¼ at the close.

QUICKSILVER.

Quicksilver has steadily declined during the entire month from $115 per flask on the first of May to $78 at the close. Heavy stocks and no demand is given as the reason for the decline.

PLATINUM.

The price of platinum has declined $5.00 per ounce from $85 at the opening to $80, a nominal quotation at the close.

SHEET METALS.

It is interesting to note that while the price of ingot copper has declined about 2 cents per pound, the more or less controlled price of sheet copper has been advanced 1 cent from 36½ cents at the opening to 37½ base for hot rolled f.o.b. mill. Copper wire is rather easier at 32 cents. High sheet brass is unchanged. Brass rods are quoted at 38 cents but there are sellers at 35 cents.

OLD METALS.

The old metal market is dull and easier. There have been some good sales of brass scrap for export but business just now is dull owing to the decline in ingot copper and all other metals.—J. J. A.

MAY MOVEMENTS IN METALS

	Highest.	Lowest.	Closing.
Copper.			
Lake	30.50	28.00	28.25
Electrolytic	31.00	28.25	28.50
Casting	28.00	26.00	26.00
Tin	51.50	45.75	45.75
Lead	7.50	7.25	7.25
Spelter	17.80	13.30	13.50
Antimony (Chinese and Jap.)	38.50	25.00	25.50
Silver	77¼	68¾	68¾

WATERBURY AVERAGE

The average prices of Lake Copper and Brass Mill Spelter per pound as determined monthly at Waterbury, Conn.:

Lake Copper. 1915—Average for year, 18.94. 1916—January, 24.75. February, 27.75. March, 28. April, 29. May, 29⅞.

Brass Mill Spelter. 1915—Average for year, 17.50. 1916—January, 22.25. February, 22.75. March, 23.15. April, 23.20. May, 21.20.

DAILY METAL PRICES

By an arrangement with the daily metal papers, The Metal Industry can furnish daily metal prices, and we offer a special combination subscription price of $10 per year for this service. The price of the daily paper alone is $10 and of The Metal Industry alone $1.00—combination offer $10.

Metal Prices, June 5, 1916

NEW METALS.	Price per lb. Cents.
COPPER—DUTY FREE. PLATE, BAR, INGOT AND OLD COPPER. Manufactured 5 per centum.	
Lake, carload lots, nominal	28.50
Electrolytic, carload lots	29.00
Casting, carload lots	26.00
TIN—Duty Free.	
Straits of Malacca, carload lots	45.75
LEAD—Duty Pig (Bars and Old 25%; pipe and sheets 20%. Pig lead, carload lots	7.00
SPELTER—Duty 15%.	
Brass Special	17.00
Prime Western, carload lots, nominal	13.40
ALUMINUM—Duty Crude, 2c. per lb. Plates, sheets, bars and rods, 3½. per lb.	
Small lots, f. o. b. factory	72.00
100-lb. lots, f. o. b. factory	66.00
Ton lots, f. o. b. factory	63.00
ANTIMONY—Duty 10%.	
Cookson's cask lots, nominal	.....
Hallett's cask lots, nominal	.....
American	25.50
Chinese, Japanese	25.50
NICKEL—Duty Ingot, 10%. Sheet, strip and wire 20% ad valorem.	
Shot, Placquettes, Ingots, Blocks	45.00
ELECTROLYTIC—5 cents per pound extra.	
MANGANESE METAL	nominal
MAGNESIUM METAL—Duty 25% ad valorem (100 lb. lots)	5.00
BISMUTH—Duty free	5.00
CADMIUM—Duty free nominal	1.90
CHROMIUM METAL—Duty free	.75
COBALT—97% pure	2.00
QUICKSILVER—Duty, 10% per flask of 75 pounds	80.00
GOLD—Duty free	$20.67
PLATINUM—Duty free $85.00 to	88.00
SILVER—Government assay—Duty free	.68¾

INGOT METALS.	Price per lb. Cents.
Silicon Copper, 10% according to quantity	37 to 45
Silicon Copper, 20% " "	42 to 45
Silicon Copper, 30% guaranteed " "	49 to 52
Phosphor Copper, guaranteed 15% " "	33½ to 35
Phosphor Copper, guaranteed 10% " "	32 to 33½
Manganese Copper, 30%, 2% Iron " "	48 to 53
Phosphor Tin, guaranteed 5% " "	60 to 65
Phosphor Tin, no guarantee " "	52 to 53
Brass Ingot, Yellow " "	20 to 21
Brass Ingot, Red " "	24 to 24½
Bronze Ingot " "	23½ to 24½
Parsons' Manganese Bronze Ingots " "	31 to 32½
Manganese Bronze " "	30 to 31
Phosphor Bronze " "	24 to 26
Casting Aluminum Alloys " "	49 to 51½

PHOSPHORUS—Duty free. According to quantity	35 to 40

Dealers' Buying Prices. Cents per lb.	OLD METALS.	Dealers' Selling Prices. Cents per lb.
22.00 to 23.00	Heavy Cut Copper	25.00 to 26.00
21.00 to 22.00	Copper Wire	24.00 to 25.00
18.00 to 19.00	Light Copper	21.00 to 22.00
17.00 to 17.50	Heavy Mach. Comp	18.50 to 19.00
13.50 to 14.00	Heavy Brass	16.00 to 16.50
11.00 to 12.00	Light Brass	13.00 to 13.50
14.00 to 15.00	No. 1 Yellow Brass Turnings	15.50 to 16.00
14.00 to 15.00	No. 1 Comp. Turnings	16.00 to 17.00
6.50 to	Heavy Lead	.... to 7.00
12.00 to 13.00	Zinc Scrap	14.00 to 15.00
25.00 to 30.00	Scrap Aluminum Turnings	25.00 to 30.00
30.00 to 35.00	Scrap Aluminum, cast alloyed	35.00 to 40.00
35.00 to 40.00	Scrap Aluminum, sheet (new)	45.00 to 50.00
23.00 to 24.00	No. 1 Pewter	25.00 to 26.00
20.00 to 24.00	Old Nickel	20.00 to 24.00
20.00 to 24.00	Old Nickel anodes	20.00 to 25.00

PRICES OF SHEET COPPER.

BASE PRICE—Mill (Hot-rolled), 37.50c.; Jobbers, 39c.

SIZE OF SHEETS.		64 oz. and over.	32 oz. to 64 oz.	24 oz. up to 32 oz.	16 oz. up to 24 oz.	15 oz.	14 oz.	13 oz.	12 oz.	11 oz.
Width.	LENGTH.	Extras in Cents per Pound for Sizes and Weights Other than Base.								
Not wider than 30 ins.	Not longer than 72 inches.	Base	Base	Base	Base	½	1	1½	2	2½
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	½	1	2	3	4½
	Longer than 96 inches. Not longer than 120 inches.	"	"	½	1	2	3	5	7	
	Longer than 120 ins.	"	"	1	1½					
Wider than 30 ins., but not wider than 36 inches.	Not longer than 72 inches.	"	"	Base	Base	1	2	3	4	6
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	1	2	4	6	8
	Longer than 96 inches. Not longer than 120 inches.	"	"	1	2	3	4			
	Longer than 120 inches.	"	1	2	3					
Wider than 36 ins., but not wider than 48 inches.	Not longer than 72 inches	"	Base	1	2	3	4	6	8	9
	Longer than 72 inches. Not longer than 96 inches.	"	"	1	3	4	5	7	9	
	Longer than 96 inches. Not longer than 120 inches.	"	"	2	4	6	9			
	Longer than 120 inches.	"	1	3	6					
Wider than 48 ins., but not wider than 60 inches.	Not longer than 72 inches.	"	Base	1	3	5	7	9	11	
	Longer than 72 inches. Not longer than 96 inches.	"	"	2	4	7	10			
	Longer than 96 inches. Not longer than 120 inches.	"	1	3	6					
	Longer than 120 inches.	1	2	4	8					
Wider than 60 ins., but not wider than 72 ins.	Not longer than 96 inches.	Base	1	3	8					
	Longer than 96 inches. Not longer than 120 inches.	"	2	5	10					
	Longer than 120 inches.	1	3	8						
Wider than 72 ins., but not wider than 108 ins.	Not longer than 96 inches.	1	3	6						
	Longer than 96 inches. Not longer than 120 inches.	2	4	7						
	Not longer than 120 inches.	3	5	9						
Wider than 108 ins., but not wider than 120 ins.	Not longer than 120 inches.	4	6							

The longest dimension in any sheet shall be considered as its length.

CIRCLES, 8 IN. DIAMETER AND LARGER, SEGMENTS AND PATTERN SHEETS, advance per pound over prices of Sheet Copper required to cut them from ..... 3c.

CIRCLES LESS THAN 8 IN. DIAMETER, advance per pound over prices of Sheet Copper required to cut them from ..... 5c.

COLD OR HARD ROLLED COPPER, 14 oz. per square foot and heavier, advance per pound over foregoing prices ..... 1c.

COLD OR HARD ROLLED COPPER, lighter than 14 oz. per square foot, advance per pound over foregoing prices ..... 2c.

COLD ROLLED ANNEALED COPPER, the same price as Cold Rolled Copper.

ALL POLISHED COPPER, 20 in. wide and under, advance per square foot over the price of Cold Rolled Copper ..... 1c.

ALL POLISHED COPPER, over 20 in. wide, advance per square foot over the price of Cold Rolled Copper ..... 2c.

For Polishing both sides, double the above price.

The Polishing extra for Circles and Segments to be charged on the full size of the sheet from which they are cut.

COLD ROLLED COPPER, prepared suitable for polishing, same prices and extras as Polished Copper.

ALL PLANISHED COPPER, advance per square foot over the prices for Polished Copper ..... 1c.

ZINC—Duty, sheet, 15%.

	Cents per lb.
Carload lots, standard sizes and gauges, at mill....21.00 cent basis, less 8%	
Casks, jobbers' prices	22.50
Open casks, jobbers' prices	24.00

Metal Prices, June 5, 1916

PRICES ON BRASS MATERIAL—MILL SHIPMENTS.

In effect May 10, 1916.

To customers who buy over 5,000 lbs. per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet	$0.40	$0.41	$0.42
Wire	.40	.41	.42
Rod	.40	.42	.43
Brazed tubing	.45	—	.47
Open seam tubing	.45	—	.47
Angles and channels	.45	—	.47

To customers who buy 5,000 lbs. or less per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet	$0.42	$0.43	$0.44
Wire	.42	.43	.44
Rod	.42	.44	.45
Brazed tubing	.47	—	.49
Open seam tubing	.47	—	.49
Angles and channels	.47	—	.49

[Note.—Net extras for quality for both sections of above metal prices are not quoted due to the fluctuations in the price of zinc.—Ed.]

BARE COPPER WIRE—CARLOAD LOTS.

32½c. per lb. base.

SOLDERING COPPERS.

300 lbs. and over in one order	38c.	per lb. base
100 lbs. to 300 lbs. in one order	38½c.	" " "
Less than 100 lbs. in one order	40c.	" " "

PRICES FOR SEAMLESS BRASS AND COPPER TUBING.

From 1¼ to 3½ O. D. Nos. 4 to 13 Stubs' Gauge, — per lb.
Seamless Copper Tubing, — per lb.

For other sizes see Manufacturers' List.

Due to fluctuations of the metal market we are unable to quote these prices.

PRICES FOR SEAMLESS BRASS TUBING Iron Pipe Sizes.

Iron pipe sizes with price per pound.

⅛ ¼ ⅜ ½ ¾ 1 1¼ 1½ 2 2½ 3 3½ 4 4½ 5 6

Due to fluctuations of the metal market we are unable to quote these prices.

PRICE LIST OF IRON LINED TUBING—NOT POLISHED.

	Per 100 feet Brass.	Bronze.
⅜ inch		
½ inch		
⅝ inch		
¾ inch		
⅞ inch		
1 inch		
1⅛ inch		
1¼ inch		
1½ inch		
1¾ inch		
2 inch		

Due to fluctuations of the metal market we are unable to quote these prices.

PRICES FOR TOBIN BRONZE AND MUNTZ METAL.

Tobin Bronze Rod	42c.	net base
Muntz or Yellow Metal Sheathing (14" x 48")	40c.	" "
Muntz or Yellow Metal Rectangular sheets other than Sheathing	43c.	" "
Muntz or Yellow Metal Rod	41½c.	" "

Above are for 100 lbs. or more in one order.

PLATERS' METALS.

Platers' bar in the rough, 58c. net.

German silver platers' bars dependent on the percentage of nickel, quantity and general character of the order.

Platers' metal, so called, is very thin metal not made by the larger mills and for which prices are quoted on application to the manufacturer.

PRICES FOR SHEET BLOCK TIN AND BRITANNIA METAL.

Sheet Block Tin—18" wide or less. No. 26 B. & S. Gauge or thicker. 100 lbs. or more 5c. over Pig Tin. 50 to 100 lbs. 6c. over. 25 to 50 lbs. 8c. over, less than 25 lbs. 10c. over.

No. 1 Britannia—18" wide or less. No. 26 B. & S. Gauge or thicker. 100 lbs. or more 7c. over Pig Tin. 50 to 100 lbs. 8c. over. 25 to 50 lbs. 15c. over, less than 25 lbs. 3c. over.

Above prices f. o. b. mill.

Prices on wider or thinner metal on request.

PRICE SHEET FOR SHEET ALUMINUM—B. & S. Gauge.

Base price, 60c.

Gauge.	Width. Inches.	1 ton.	50 to 2,000 lbs.	Less than 50 lbs.
20 and heavier	3-30			
	3-30			
21 to 24 inclusive	30-48			
	48-60			
25 to 26	3-30			
	30-48			
27	3-30			
	30-48			
28	3-30			
	30-48			
29	3-30			
	30-48			
30	3-30			

We are unable to quote these prices, but they can be had upon application to manufacturers and dealers.

The above prices refer to lengths between 2 and 8 feet. Prices furnished by the manufacturers for wider and narrower sheet. No charge for boxing. F. O. B. Mill.

PRICE LIST SEAMLESS ALUMINUM TUBING.

STUBS' GAUGE THE STANDARD. SIZES CARRIED IN STOCK.

Outside Diameters.

Stubs' Gauge.	Inches.	⅛ in.	5/16 in.	⅜ in.	½ in.	⅝ in.	¾ in.	⅞ in.	1 in.	1¼ in.	1½ in.	1¾ in.	2 in.	2½ ins.	3 ins.	3½ ins.	4 ins.	4½ ins.
11.	.120.																	
12.	.109.																	
14.	.083.																	
16.	.065.																	
18.	.049.																	
20.	.035.																	
21.	.032.																	
22.	.028.																	
24.	.022.																	

We are unable to quote these prices, but they can be had on application to manufacturers and dealers.

Prices are for ten or more pounds at one time. For prices on sizes not carried in stock send for Manufacturers' List.

PRICE LIST FOR ALUMINUM ROD AND WIRE.

We are unable to quote these prices.

BASE PRICE GRADE "B" GERMAN SILVER SHEET METAL.

Quality.	Net per lb.	Quality.	Net per lb.
5%	44c.	16%	48c.
8%	45½c.	18%	48½c.
10%	46c.	20%	51c.
12%	47c.	25%	60c.
15%	47½c.	30%	66c.

GERMAN SILVER WIRE.

Quality	Net per lb.	Quality.	Net per lb.
5%	47c.	15%	53¾c
8%	49c.	16%	54¼c.
10%	50½c.	18%	56¼c.
12%	52¼c.	30%	71½c.

The above Base Prices are subject to additions for extras as per lists printed in Brass Manufacturers' Price List and from such extras 50% discount will be allowed. The above base prices and discounts are named only to wholesale buyers who purchase in good quantities. Prices on small lots are considerably higher.

PRICES OF SHEET SILVER.

Rolled sterling silver .925 fine is sold according to gauge quantity and market conditions. No fixed quotations can be given, as prices range from 1c. below to 4c. above the price of bullion.

Rolled silver anodes .999 fine are quoted at 2½c. to 3½c. above the price of bullion.